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REMEDIAL INVESTIGATION BADGER ARMY AMMUNITION PLANT BARABOO, WISCONSIN

FINAL
REMEDIAL INVESTIGATION REPORT
APPENDIX
DATA ITEM A009

APPENDICES A THROUGH D
VOLUME 1 OF 7

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UNITED STATES ARMY
TOXIC AND HAZARDOUS MATERIALS AGENCY
ABERDEEN PROVING GROUND, MARYLAND

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**REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT**

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APPENDIX A

**LOCATION-SPECIFIC AND CHEMICAL-SPECIFIC
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS**

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APPENDIX A1: SUMMARY OF FEDERAL ARARS AND GUIDANCE MATERIALS

Archeological and Historical Preservation Act, 40 CFR 6.301(c)

This law establishes procedures to provide for preservation of historical and archeological data which might be destroyed through alteration of terrain as a result of a Federal construction project or a Federally licensed activity or program. To comply with this law, a determination should be made that no historical or archeological data would be disturbed because of activity associated with remedial investigation or actions at a site.

Clean Air Act (CAA), National Ambient Air Quality Standards; 40 CFR Part 50 Part A

Site remediation activities must comply with the National Ambient Air Quality Standards (NAAQS). The most relevant pollutant standard is for particulate matter less than 10 microns in size (PM_{10}) outlined in 40 CFR Section 50.6. The PM_{10} standard for a 24-hour period is 150 micrograms per cubic meter ($\mu g/m^3$) of air, not to be exceeded more than once a year. The PM_{10} standard is based on the detrimental effects of particulate matter to the lungs. Remedial construction activities such as excavation will need to ensure compliance with the PM_{10} standard. NAAQS for the six criteria pollutants are listed below:

National Ambient Air Quality Standards	
Criteria Pollutant	Standards
Carbon Monoxide	Maximum 1-hr concentration not to be exceeded more than once per year - 35 ppm Maximum 8-hr concentration not to be exceeded more than once per year - 9 ppm
Lead	Maximum quarterly arithmetic mean - $1.5 \mu g/m^3$
Nitrogen Dioxide	Annual arithmetic mean - $53 \mu g/m^3$

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National Ambient Air Quality Standards	
Criteria Pollutant	Standards
PM ₁₀	24-hr average concentration not to be exceeded more than once per year - 150 $\mu\text{g}/\text{m}^3$ Expected annual arithmetic mean concentration - 50 $\mu\text{g}/\text{m}^3$
Ozone	Daily maximum 1-hr concentration, not to be exceeded more than one day per year - 0.12 ppm
Sulfur	Annual Arithmetic Mean - 0.03 ppm Maximum 24-hr concentration not to be exceeded more than once per year - 0.14 ppm Secondary standard: Maximum 3-hr concentration not to be exceeded more than once per year - 0.5 ppm

The attainment and maintenance of primary and secondary standards are required to protect public health and welfare (wildlife, climate, recreation, transportation, and economic values). The principal application of these standards is during remedial activities resulting in exposures through dust and vapors. NAAQSs do not apply directly to source-specific emissions limitations. Instead, the State translates the emission limitations into source-specific limitations through State Implementation Plans (SIPs), discussed in 40 CFR Part 52, Subpart YY - Wisconsin.

CAA, Prevention of Significant Deterioration Requirements; 40 CFR Part 52.21

This regulation established requirements for "major sources" of emissions in air control attainment areas (as opposed to non-attainment areas). Major sources for attainment are defined as a source which either emits 250 tons/year (tpy) of any regulated pollutant, or if the site has facility, such as an incinerator or chemical processing plant, which emits 100 or more tpy of a regulated pollutant. Attainment areas are those regions of the country that are designated as being in compliance with the NAAQS priority pollutants. Air emission requirements may vary depending upon whether the area in which the source is located is an attainment or a non-

attainment area. Non-attainment areas are those parts of the country where compliance has not been attained for one or several criteria pollutants. Sauk county, in which Badger Army Ammunition Plant (BAAP) is located, is designated as an attainment area for all regulated air pollutants.

Because of the location of the facility within an attainment area, Prevention of Significant Deterioration (PSD) regulations apply. The PSD regulations classify PSD areas as either Class I, Class II, or Class III. The classification of a particular area within a state is established within the SIP. Significant deterioration is said to occur when the amount of the new pollution exceeds the maximum allowable increment for the applicable class. The allowable increments are listed in the table below.

ALLOWABLE PSD INCREMENTS (micrograms per cubic meter)			
	Class I	Class II	Class III
Sulfur Dioxide			
annual	2	20	40
24-hour	5	91	182
3-hour	25	512	700
Total Suspended Particulate Matter (TSP)			
annual	5	19	37
24-hour	10	37	75

The PSD requirements are implemented through a pre-construction review process. The review process requires that affected sources comply with NAAQS and that an emission limit that reflects the installation and operation of Best Available Control Technology (BACT) is established. PSD permit regulations also require an ambient impact analysis to demonstrate the impact of the new source or modification on compliance with the NAAQS. It may be possible to demonstrate compliance by showing that impacts on air quality of the proposed source are below the significant ambient concentrations established by USEPA and shown in the following table, adapted from 40 CFR Part 52.21(i)(8)(i).

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SIGNIFICANT AMBIENT CONCENTRATIONS	
Pollutant	Concentration (micrograms per cubic meter)
Carbon Monoxide	575 (8-hour average)
Nitrogen Dioxide	14 (annual average)
Particulate Matter	10 TSP (24-hour average) 10 PM ₁₀ (24-hour average)
Sulfur Dioxide	13 (24-hour average)
Lead	0.1 (3-month average)
Mercury	0.25 (24-month average)
Beryllium	0.001 (24-hour average)
Fluorides	0.25 (24-month average)
Vinyl Chloride	15 (24-hour average)
Total Reduced Sulfur	10 (1-hour average)
Hydrogen Sulfide	0.2 (1-hour average)
Reduced Sulfur Compounds	10 (1-hour average)

CAA, State Implementation Plans; 40 CFR Part 52, Subpart YY - Wisconsin

The SIP for Wisconsin implements requirements established by the CAA. The Wisconsin SIP is composed of citations of the State air regulations, which are at least as stringent as the CAA requirements. The SIP also divides the state into Air Quality Control Regions and assigns PSD classifications for each region. The SIP is both Federally enforceable and a potential Federal Applicable or Relevant and Appropriate Requirement (ARAR).

CAA, New Source Performance Standards; 40 CFR Part 60

This regulation establishes new source performance standards (NSPS) as follows:

New Source	Standards
Incineration	Particulate emissions shall be less than 0.08 grains per dry standard cubic foot corrected to 12% carbon dioxide.
Statutory Gas Turbines	Standard for NO _x emission. SO ₂ emissions shall be less than 0.015% by volume at 15% oxygen and on a dry basis.
Storage of Petroleum Liquids	Floating roof, vapor recovery system, or equivalent are required

The NSPSs limit the emissions of a number of different pollutants, including the six criteria pollutants as well as fluorides, sulfuric acid mist, and total reduced sulfur (including H₂S).

Because NSPS are source-specific requirements, they are not generally considered applicable to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) cleanup actions. However, an NSPS may be applicable if the facility at a CERCLA site is a new source subject to an NSPS, such as an incinerator; or a relevant and appropriate ARAR if the pollutant emitted and the technology employed during the cleanup action are sufficiently similar to the pollutant and source category regulated by an NSPS.

CAA, National Emission Standards for Hazardous Air Pollutants (NESHAP); 40 CFR Part 61

This regulation establishes emission levels for certain hazardous air pollutants. NESHAPs are not generally applicable to Superfund remedial activities because CERCLA sites do not usually contain any of the specific source categories regulated. NESHAPs are also not generally relevant and appropriate because the standards of control are intended for the specific type of source regulated. Part of a NESHAP

APPENDIX A

may be relevant and appropriate if a component of a particular alternative falls into a regulated category (i.e., the NESHAP for an manufacturing air stripper for a particular contaminant may be relevant and appropriate for an air stripper as a component of a cleanup alternative.

Clean Air Act Amendments (CAAA) of 1990: The CAA Amendments of 1990 established the requirement to promulgate new emissions standards for sources of 189 listed hazardous air pollutants (HAPs). These standards must reflect the maximum achievable control technology (MACT) considering cost, energy requirements and other impacts. MACT standards for each of the listed categories will be issued progressively within 10 years. The categories to be regulated will include a category referred to as "Waste Treatment and Disposal". Standards for the waste treatment and disposal category are scheduled for November 15, 1994.

The CAAAs establish a threshold for sources to be regulated under the air toxics program. For this purpose, a major source is defined as a source with the potential to emit greater than 10 tpy of any one of the listed HAPs, or greater than 25 tpy of any combination of listed HAPs, assuming operation of the facility at maximum capacity for 24 hours per day, 365 days per year. Major sources are then subject to the permitting requirements established in the CAAAs.

Clean Water Act (CWA)

The Clean Water Act was enacted to restore and maintain the quality of surface waters. The CWA regulations that are most likely to be ARARs for Superfund actions are the requirements for:

- Surface water quality, (Quality Criteria for Water)
- Direct discharges to surface waters, (National Pollutant Discharge Elimination System);
- Indirect discharges to publicly-owned treatment works, (National Pretreatment Program);
- Discharges of dredge-and-fill materials to surface waters, (Guidelines for Specification of Disposal Sites for Dredged or Fill Material).

Each of these regulations, in addition to the regulations governing discharge of radioactive pollutants to surface waters and oil pollution control are discussed in the following paragraphs. There are three categories of pollutants regulated under the various parts of the CWA listed below:

- Toxic pollutants identified in CWA Section 307(a)(1);
- Conventional pollutants including biochemical oxygen demand (BOD), total suspended solids (TSS), fecal coliform, oil and grease, and pH (CWA Section 304(a)(4); and
- Nonconventional pollutants which are defined as any pollutant not identified as either conventional or toxic in accordance with 40 CFR 122.21(1)(2).

CWA, Ambient Water Quality Criteria; 40 CFR Part 131

Federal Ambient Water Quality Criteria (AWQC) under the Clean Water Act are non-enforceable guidance established by the U.S. Environmental Protection Agency (USEPA) for evaluating toxic effects on human health and aquatic organisms. AWQC are used or considered by the States in setting their water quality standards.

AWQC may be potential relevant and appropriate ARARs for groundwater in instances where Maximum Contaminant Levels (MCLs) or Maximum Contaminant Level Goals (MCLGs) are not sufficiently stringent to be protective of the environment. In instances where the contaminants present an environmental concern, the MCLs and MCLGs should be compared, and the more stringent should be considered as the potential relevant and appropriate requirement for the site. However, while it is possible to derive cleanup levels for drinking water from AWQC, these values are not intended to be used as drinking-water cleanup standards, since no criteria are provided human exposure from ingestion of water alone. Carcinogens, which have a AWQC of zero, are not considered relevant and appropriate because they cannot be measured. This policy is consistent with the zero value for MCLGs under the Safe Drinking Water Act (SDWA). AWQC for non-carcinogens are generally set above zero, and address chronic and toxic effects. Table A-1 lists the AWQC published for two human exposure scenarios as well as acute and chronic toxicity for fresh water aquatic life.

TABLE A-1
CHEMICAL SPECIFIC STANDARDS AND GUIDANCE
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITIONS PLANT

CHEMICAL		SAFE DRINKING WATER ACT (SDWA) (d)		CWA WATER QUALITY CRITERIA (c)			WI PUBLIC HEALTH GROUNDWATER QUALITY STANDARDS (b)			
		MCL (ug/l) (a)	MCLG (ug/l)	FOR PROTECTION OF HUMAN HEALTH	FOR PROTECTION OF AQUATIC LIFE		CURRENT STANDARDS	PROPOSED STANDARDS		
CHEMICAL CODE	CHEMICAL NAME			WATER AND FISH CONSUMPTION (ug/l)	FISH CONSUMPTION ONLY (ug/l)	FRESHWATER ACUTE/CHRONIC (ug/l)	MAINE ACUTE/CHRONIC (ug/l)	ENFORCEMENT STANDARDS (ug/l)	PAL (ug/l)	PAL (ug/l)
ACRYLO	acrylonitrile	-	-	0.056	0.65	7,500/2,600 (10)	-	-	-	-
AL	aluminum	50-200 (1)	-	(2)	(2)	(2)	(2)	-	-	-
ALK	alkalinity	-	-	-	-	- /20 ppm	-	-	-	-
AS	arsenic	50 (3)	-	0.0022	0.0175	-	-	50	5	-
B2EHP	bis(2-ethylhexyl) phthalate	4 (4)	0	15,000	50,000	400/300 (4)	400/360 (4)	3	0.3	-
BA	barium	2,000	2,000	1,000	-	-	-	1,000	200	400
C2H3CL	vinyl chloride	2	0	2	525	-	-	0.2	0.0015	0.02
C6H6	benzene	5	0	0.66	40	5,300/- (5)	5,100/700 (5)	5	0.067	0.5
CA	calcium	-	-	-	-	-	-	-	-	-
CCL4	carbon tetrachloride	5	0	0.4	6.94	35,200/- (5)	50,000/- (5)	5	0.5	-
CD	cadmium	5	5	10	-	3.9/1.1 (4)	43/6.3	10	1	0.5
CHCL3	chloroform	100 (6)	-	0.19	15.7	26,900/1,240 (5)	-	6	0.6	-
CL	chloride	250,000 (7)	-	-	-	660,000/230,000	-	250,000 (7)	125,000 (7)	-
CO	cobalt	-	-	-	-	-	-	-	-	-
CR	chromium (total)	100	100	-	-	-	-	50	5	100
CS2	carbon disulfide	-	-	-	-	-	-	-	-	-
12DCLE	1,2-dichloroethane	5	0	0.94	243	118,000/20,000 (5)	11,300/- (5)	5	0.05	0.5
DEP	diethylphthalate	-	-	350,000	1,800,000	-	-	-	-	-
DNBP	di-n-butyl phthalate	-	-	34,000	154,000	-	-	-	-	-

TABLE A-1
CHEMICAL SPECIFIC STANDARDS AND GUIDANCE
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITIONS PLANT

CHEMICAL CODE	CHEMICAL NAME	SAFE DRINKING WATER ACT (SDWA) (d)		CWA WATER QUALITY CRITERIA (c)			WI PUBLIC HEALTH GROUNDWATER QUALITY STANDARDS (b)			
		MCL ($\mu\text{g/l}$) (a)	MCLG ($\mu\text{g/l}$)	FOR PROTECTION OF HUMAN HEALTH		MAIINE ACUTE/CHRONIC ($\mu\text{g/l}$)	CURRENT STANDARDS		ENFORCEMENT STANDARDS ($\mu\text{g/l}$)	PAL ($\mu\text{g/l}$)
				WATER AND FISH CONSUMPTION ($\mu\text{g/l}$)	FISH CONSUMPTION ONLY ($\mu\text{g/l}$)		ENFORCEMENT STANDARDS ($\mu\text{g/l}$)	PAL ($\mu\text{g/l}$)		
DNOP	d-n-octyl phthalate	-	-	-	-	-	-	-	-	-
24DNT	2,4-dinitrotoluene	-	-	0.11	9.1	330/230 (5)	0.05	0.005	-	-
26DNT	2,6-dinitrotoluene	-	-	-	-	-	0.05	0.005	-	-
FANT	fluoroanthene	-	-	42	54	3,900/- (3)	-	-	-	-
FE	iron	300 (1)	-	300	-	-/1	300 (7)	150 (7)	-	-
HARD	hardness	-	-	-	-	-	-	-	-	-
HG	mercury	2	2	0.144	0.148	2,40,012	2	0.2	-	-
MEC6H5	toluene	1,000	1,000	14,300	424,000	17,500/- (5)	343	68.6	40 (8)	20 (8)
MEK	2-butanone	-	-	-	-	-	460	90	-	-
MN	manganese	50 (1)	200 (4)	50	100	-	50 (7)	25 (7)	-	-
2MNAP	2-methylnaphthalene	-	-	-	-	-	-	-	-	-
NA	sodium	(9)	-	-	-	-	-	-	-	-
2NANIL	2-nitroaniline	-	-	-	-	-	-	-	-	-
3NANIL	3-nitroaniline	-	-	-	-	-	-	-	-	-
4NANIL	4-nitroaniline	-	-	-	-	-	-	-	-	-
NAP	naphthalene	-	-	-	-	2,300/620 (5)	40	6	-	-
NB	nitrobenzene	-	-	19,800	-	27,000/- (5)	-	-	-	-
NG	nitroglycerine	-	-	-	-	-	-	-	-	-

TABLE A-1
CHEMICAL SPECIFIC STANDARDS AND GUIDANCE
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITIONS PLANT

CHEMICAL		SAFE DRINKING WATER ACT (SDWA) (d)		CWA WATER QUALITY CRITERIA (c)			WI PUBLIC HEALTH GROUNDWATER QUALITY STANDARDS (b)			
				FOR PROTECTION OF HUMAN HEALTH		FOR PROTECTION OF AQUATIC LIFE				
CHEMICAL CODE	CHEMICAL NAME	MCL (ug/l) (a)	MCLG (ug/l)	WATER AND FISH CONSUMPTION (ug/l)	FISH CONSUMPTION ONLY (ug/l)	FRESHWATER ACUTE/CHRONIC (ug/l)	MARINE ACUTE/CHRONIC (ug/l)	CURRENT STANDARDS	PROPOSED STANDARDS	
NI	nickel	100	100	13.4	100	1,400/160 (10)	75/6.3	-	-	-
NI	nitrite/nitrate-nonspecific	10,000 (11)	10,000 (11)	-	-	-	-	10,000	2,000	-
NHOPA	n-nitrosodiphenylamine	-	-	(12)	(12)	-	-	-	-	-
NO2	nitrite	1,000	1,000	-	-	-	-	-	-	200
NO3	nitrate	10,000	10,000	10,000	-	-	-	-	-	2,000
PB	lead	TT (3)	0	50	-	63/3.2 (10)	220/6.5	50	5	15
SE	selenium	50	50	10	-	0.02/0.005	0.3/0.071	10	1	50
SO4	sulfate	250,000 (1) 400/500 (4)	400/500 (4)	-	-	-	-	250,000 (7)	125,000 (7)	-
111TCE	1,1,1-trichloroethane	200	200	19,400	1,030,000	-	31,200/ (5)	200	40	-
112TCE	1,1,2-trichloroethane	5	3	0.6	41.8	-9,400 (5)	-	0.6	0.06	-
TDS	total dissolved solids	500,000 (14)	-	-	-	-	-	-	-	-
238TMN	2,3,6-trimethylphenylene	-	-	-	-	-	-	-	-	-
TRCLE	trichloroethylene	5	0	2.7	60.7	45,000/21,000 (5)	2,000/ (5)	5	0.16	0.5

TABLE A-1
CHEMICAL SPECIFIC STANDARDS AND GUIDANCE
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITIONS PLANT

CHEMICAL	SAFE DRINKING WATER ACT (SDWA) (d)			CWA WATER QUALITY CRITERIA (e)		WH PUBLIC HEALTH GROUNDWATER QUALITY STANDARDS (b)			
	FOR PROTECTION OF HUMAN HEALTH		MCLG (µg/l)	FOR PROTECTION OF AQUATIC LIFE		CURRENT STANDARDS		PROPOSED STANDARDS	
	WATER AND FISH CONSUMPTION (µg/l)	FISH CONSUMPTION ONLY (µg/l)		FRESHWATER ACUTE/CHRONIC (µg/l)	MAINE ACUTE/CHRONIC (µg/l)	ENFORCEMENT STANDARDS (µg/l)	PAL (µg/l)	ENFORCEMENT STANDARDS (µg/l)	PAL (µg/l)
CHEMICAL CODE	MCL (µg/l) (a)								
ZN									
Zinc	5000 (1)			102/110 (10)	95/86 (10)	5,000 (7)	2,500 (7)		

Sources:

- (a) U.S. Environmental Protection Agency (EPA), 1991, "Fact Sheet: National Primary Drinking Water Standards", Office of Water, Washington, D.C. August, 1991; EPA, 1991, "Fact Sheet: National Secondary Drinking Water Standards", Office of Water, Washington, D.C., September, 1991; and EPA, 1990, "National Primary and Secondary Drinking Water Regulations: Synthetic Organic Chemicals and Inorganic Chemicals, Final Rule", 57FR31778, July 17, 1992.
- (b) Wisconsin Administrative Code, Chapter NR 140.10, Table 1.

Notes:

- (1) Secondary drinking water standards, suggested level
- (2) Criteria are pH dependent. Refer to 53FR33178.
- (3) MCL for arsenic currently under review.
- (4) Proposed value.
- (5) Insufficient data to develop criteria. Value presented is the lowest observed effect level.
- (6) Standard indicated is propose value for total trihalomethanes (i.e., chloroform, dibromomethane, bromodichloromethane, and bromoform).
- (7) Values are for protection of public welfare (usually aesthetic concerns) rather than for protection of public health. Public welfare standards may not be enforced as rigorously as public health standards.

Acronyms:

- CWA Clean Water Act
EPA United States Environmental Protection Agency
IPRS Integrated Risk Information System
MCL Maximum Contaminant Level
µg/l micrograms per liter, equivalent to parts per billion

- (c) EPA, 1991, "Water Quality Criteria Summary"; Office of Science and Technology, Health and Ecological Criteria Division, Ecological Risk Assessment Branch, Human Risk Assessment Branch; Washington, D.C. May 1, 1991.
- (d) EPA SDWA National Primary Drinking Water Regulations per 40 CFR 141: MCLs and MCLGs.

- (8) WDNR proposes to delete toluene from regulation as a public health water quality standard and to promulgate a public welfare water quality standard.
- (9) No MCL has been set for sodium. However, a running level of 20,000 µg/l has been established as the reporting level. Monitoring is required and data is reported to health officials to protect individuals on restricted sodium diet.
- (10) Hardness dependent criteria (100 mg/l CaCO₃ used).
- (11) Standard indicated is for total nitrite/nitrate.
- (12) Although no published criteria exist, values for NNDPA have been calculated using IPRS. Refer to Source (c).
- (13) Treatment technique requirement in effect.
- (14) The Preventative Action Limit for total dissolved solids (TDS) is 200,000 µg/l above an established background concentration; there is no Enforcement Standard for TDS.

- mg/l milligrams per liter, equivalent to parts per million
PAL Preventative Action Limit
SDWA Safe Water Drinking Act
TDS Total Dissolved Solids
WDNR Wisconsin Department of Natural Resources

APPENDIX A

In the absence of any Wisconsin Surface Water Quality Standard (FWQS) specific to the pollutant and water body of concern, AWQC may be ARARs for surface-water bodies when protection of aquatic life is a concern or if human exposure from consumption of contaminated fish is a concern.

CWA, 40 CFR Part 122, 125 - National Pollutant Discharge Elimination System (NPDES)

The CWA controls the direct discharge of pollutants to surface water through the NPDES program. NPDES requires permits for direct discharges to surface waters. The permits contain limits based on either effluent standards or AWQC if they are more stringent. An on-site discharge from a CERCLA site to surface waters must meet the substantive NPDES requirements, but need not obtain an NPDES permit to comply with the administrative requirements of the permitting process, consistent with CERCLA section 121(e)(1). On the other hand, an off-site discharge from a CERCLA site to surface waters is required to obtain an NPDES permit and to meet both the substantive and administrative NPDES requirements. Examples of direct discharges include:

- On-site waste treatment whereby wastewater (which may include contaminated groundwater which is pumped, treated, and discharged to surface water), is discharged into or very close to a surface-water body through a discernable conveyance such as a pipe, ditch, channel, tunnel, or well.
- Off-site treatment whereby wastewater is discharged by a discernable conveyance to an off-site surface water body.
- Any remedial action where site runoff is channeled directly to a surface-water body through a ditch, culvert, storm sewer, or other means.
- Unchanneled runoff from a site into surface water.

CWA, 40 CFR Part 403, Section 307 (b) - National Pretreatment Program

If a groundwater treatment system is installed at the site and the discharge is to be sent to a publicly owned treatment works (POTW), then pretreatment standards

under the federal CWA apply. CWA Section 307(b) authorized the National Pretreatment Program to regulate the introduction of pollutants from nondomestic sources into POTWs. The goal of the program is to prevent discharges into POTWs that (1) will interfere with the operation of a POTW, including interferences with sludge use or disposal; (2) will pass through the POTW; or (3) will be otherwise incompatible with the POTW. The National Pretreatment Program consists of the following interacting elements:

- national categorical standards
- prohibited discharge standards
- local limitations

Because the national categorical standards provide limits on discharges from particular industries, they are not applicable to the site. The prohibited discharge standards consist of general prohibitions, specific prohibitions, and local limitations, and are discussed in the following subsections.

General Prohibitions

General prohibitions of pretreatment regulations (40 CFR Section 403.5(a)) are intended to control the introduction of certain contaminants into POTWs to (1) prevent interference with POTW operation, (2) prevent passage of contaminants through the POTW, and (3) improve opportunities to recycle and reclaim municipal and industrial wastewater and sludge.

Specific Prohibitions

Specific prohibitions of the National Pretreatment Program (40 CFR Section 403.5(6)) are intended to protect against discharges that cause (1) fire or explosion hazards, (2) corrosive structural damage to a POTW, (3) obstruction of flow into a sewer system, (4) interference due to a pollutant's high concentration, or (5) a temperature increase that would inhibit biological activity at a POTW.

Local Limitations

Local limitations are specific requirements developed and enforced by POTWs. POTWs develop limitations to meet state and local regulations in conjunction with general and specific prohibitions. These limitations should be periodically reviewed

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and revised to respond to changes in federal or state regulations or criteria, or plant operations at the POTW. For POTWs to develop local limitations, the statutory and regulatory requirements of the CWA and General Pretreatment Regulations and state and local requirements must be addressed.

Quality Criteria for Water: 40 CFR Part 131

AWQC are non-enforceable, health-based criteria developed for 95 carcinogenic and noncarcinogenic compounds. AWQC were developed under CWA Section 304 and are used by the state, in conjunction with a designated use for the surface water body, to establish water quality standards under CWA Section 303. AWQC provide levels of exposure from drinking the water and consuming aquatic life which are protective of public health. AWQC also provide acute and chronic concentrations for protection of freshwater and marine organisms. AWQC for non-carcinogens are generally set above zero, and address chronic and toxic effects. AWQC for carcinogens are recommended at zero. Table A-1 lists the AWQC published for two human exposure scenarios as well as acute and chronic toxicity for fresh water aquatic life.

Remedial actions involving contaminated surface water or groundwater must consider water uses and the circumstances of the release or threatened release. If a groundwater treatment system is installed at the site and the discharge from this system is sent to an on-site surface water body, the federal AWQC must be attained when relevant and appropriate under the circumstances of the release or the threatened release. Because compliance with AWQC is not legally required at non-Superfund site, and they are not legally applicable requirements under CERCLA.

In the absence of any FWQS specific to the pollutant and water body of concern, AWQC may be ARARs for surface-water bodies when protection of aquatic life is a concern or if human exposure from consumption of contaminated fish is a concern. When protection of aquatic life is a concern, the AWQC for fresh or saltwater aquatic life may be ARARs. When human exposure from consumption of contaminated fish is a concern, the AWQC for human exposure from consumption of fish may be ARARs for the site. AWQC are rarely determined to be ARARs for surface water or groundwater determined to be a potential current or future source of potable water. However, if contamination of a potential potable water source also presents an environmental concern, the stringency of AWQC may be compared to non-zero MCLs or MCLGs, and the more stringent of the two may be the relevant and appropriate requirement for the site.

Again, AWQC may be potential relevant and appropriate ARARs for groundwater in instances where MCLs or MCLGs are not sufficiently stringent to be protective of the environment. In instances where the contaminants present an environmental concern, the MCLs and MCLGs should be compared, and the more stringent should be considered as the potential relevant and appropriate requirement for the site. However, while it is possible to derive cleanup levels for drinking water from AWQC, these values are not intended to be used as drinking-water cleanup standards, because no criteria are provided for human exposure from ingestion of water alone. Carcinogens, which have a AWQC of zero, are not considered relevant and appropriate because they cannot be measured. This policy is consistent with the zero value for MCLGs under the SDWA.

CWA, 40 CFR Part 230 - Guidelines for Specification of Disposal Sites for Dredged or Fill Materials

The CWA regulates the discharge of dredged or fill material into U.S. waters, including wetlands. The U.S. Army Corps of Engineers (USACE) defines wetlands as those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support and, that under normal circumstances, do support a prevalence of vegetation typically adapted for life in saturated soil conditions. The purpose of Section 404 is to ensure that proposed discharges are evaluated with respect to impact on the aquatic ecosystem. The act of excavation and/or dredging is not regulated under Section 404; however, the deposition of dredged or excavated materials in U.S. waters, including wetlands, is. Discharge of fill material generally includes, without limitation, placement of fill necessary for construction and site development (e.g., dams, dikes, and levees), fill associated with the creation of ponds, and any other work involving fill material discharge. If a remedial alternative involves a dredged or fill material being discharged to a wetland, the USACE permit requirements must be attained. No procedures are set forth in the regulations for the jurisdictional determination.

No procedures are set forth in the regulations for jurisdictional determination. Therefore, to determine if an area is subject to wetlands jurisdiction and permitting requirements, the closest USACE district office should be consulted. However, USACE, in conjunction with the U.S. Fish and Wildlife Service (USFWS), USEPA, and U.S. Department of Agriculture Soil Conservation Service, developed the Federal Manual for Identifying and Delineating Jurisdictional Wetlands, which presents a multi-parameter approach to field identification of federally regulated

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wetlands (Department of the Army et al., 1989). For an area to meet the USACE definition of a wetland, it must contain hydrophytic vegetation and hydric soils, and have a hydrology indicative of a wetland. The size of the wetland is not a factor.

In addition, Section 404(b)(1), Guidelines for Specification of Disposal Sites for Dredged or Fill Material (40 CFR Part 230), maintains that no dredged or fill material discharge will be permitted if there is a practicable alternative with less impact on the aquatic ecosystem. Discharge also will not be permitted unless steps are taken to minimize potential adverse impacts, or if the discharge will cause or contribute to significant degradation of U.S. waters. If a remedial alternative involves discharging dredged or fill material to a wetland, potential short- and long-term effects must be determined, based on various physical, chemical, and biological parameters. Impacts to the following areas need to be addressed: substrate, suspended particulates, turbidity, water, current patterns and water circulations, normal water fluctuations, salinity, threatened and endangered species, fish or other aquatic organisms in the food web, and other wildlife. Effects on human use characteristics (e.g., aesthetics and recreation) also need to be addressed.

CWA, 40 CFR Part 112 - Oil Pollution Control

Under these regulations, on shore and offshore oil storage facilities that could potentially spill oil into navigable U.S. waters or onto adjoining shorelines are required to prepare and implement a Spill Prevention, Control, and Countermeasure (SPCC) plan. Specifications for secondary containment and/or diversion structures, discharge systems, and leak detection systems are outlined. Facilities that have an aggregate storage of 1,320 gallons of oil or less, provided no single container has a capacity exceeding 660 gallons, are exempt from these regulations. These requirements may be potentially relevant and appropriate ARARs for sites which include underground storage tanks.

Endangered Species Act (ESA), 40 CFR Part 302 (h)

With the vast acreage of undeveloped land available, many Army installations serve as habitat for native and migratory species including threatened and endangered flora and fauna. The ESA of 1973 as amended in 1988, governs the management of these resources and requires that proposed federal action do not jeopardize the continued existence of endangered or threatened species or result in the destruction of critical

habitat. For example, if under the ESA a baseline survey identifies listed species or areas of critical concern, a biological assessment may be required to evaluate potential adverse impacts caused by a proposed action or project.

Fish and Wildlife Coordination Act, 40 CFR 302 (g)

The Fish and Wildlife Coordination Act requires that the USFWS, National Marine Fisheries Service, and other related state agencies be consulted before a body of water, including wetlands, is modified (i.e., dredged, filled, or dammed). During the development of the site Feasibility Study (FS), alternatives proposing excavation or fill in or adjacent to a wetland will be evaluated with respect to potential impacts on wetlands.

In addition, under the Sikes Act, each military department must provide for proper fish and wildlife management. Furthermore, the Act requires resource management be carried out according to a cooperative plan mutually agreed upon by the installation commander, the regional office of the U.S. Fish and Wildlife Service, and the appropriate state agency. This Act also provides for collection of hunting and fishing fees to provide habitat improvements.

Floodplain Management Exec. Order (EO) No. 11988; (40 CFR 6.302(b) and Appendix A

This executive order requires Federal agencies to evaluate the potential effects of adverse impacts to floodplains associated with direct and indirect development of a floodplain. Alternatives that involve the alteration of a floodplain may not be selected unless a determination is made that no practicable alternative exists. If no practicable alternative exists, potential harm must be minimized and action taken to restore and preserve the natural and beneficial values of the floodplain.

Hazardous Materials Transportation Act, 49 CFR Parts 171, 173, 178, 179; Hazardous Materials Transportation Regulations

This regulation outlines procedures for the packaging, labeling, manifesting, and transporting of hazardous materials. Contaminated materials would need to be

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packaged, manifested, and transported to a licensed off-site disposal facility in compliance with these regulations.

Historic Sites, Buildings and Antiquities Act; 40 CFR 6.301 Hazardous Materials Transportation Act, 49 CFR Parts 171, 173, 178, 179; Hazardous Materials Transportation Regulations

This regulation outlines procedures for the packaging, labeling, manifesting, and transporting of hazardous materials. Contaminated materials would need to be packaged, manifested, and transported to a licensed off-site disposal facility in compliance with these regulations.

National Environmental Policy Act Regulations (NEPA), 40 CFR Part 6

Appendix A of NEPA sets forth policy for carrying out provisions of the Protection of Wetlands Executive Order (EO 11990). Under this order, federal agencies are required to minimize the degradation, loss, or destruction of wetlands, and to preserve and enhance natural and beneficial values of wetlands. Appendix A requires that no remedial alternative adversely affect a wetland if another practicable alternative is available. If no alternative is available, impacts from implementing the chosen alternative must be mitigated. During the site FS process, identification and evaluation of alternatives involving excavation, excavation transport, or fill in or adjacent to a wetland will address the alternative's impact on the wetland as it relates to NEPA.

Occupational Health and Safety Act (OSHA), General Industry Standards; 29 CFR Part 1910

This regulation establishes requirements for programs to assure worker health and safety at hazardous waste sites, including employee training requirements and permissible exposure limits for workplace exposure to a specific listing of chemicals. Under 40 CFR 300.38, requirements apply to all response activities under the National Contingency Plan (NCP).

**Occupational Health and Safety Act, Occupational Health and Safety Regulations;
29 CFR Part 1910, Subpart Z**

This subpart of 29 CFR Part 1910 establishes permissible exposure limits for workplace exposure to a specific listing of chemicals. These standards are applicable for worker exposure to OSHA hazardous chemicals during remediation activities.

OSHA, Recordkeeping, Reporting, and Related Regulations; 29 CFR Part 1904

This regulation establishes recordkeeping and reporting requirements applicable to remediation activities. These requirements apply to all site contractors and subcontractors and must be followed during all site work.

OSHA, Health and Safety Standards; 29 CFR Part 1926

This rule specifies the type of safety training, equipment, and procedures to be used during site investigation and remediation. All phases of the remedial response project should be executed in compliance with this regulation.

Protection of Wetlands EO No. 11990; 40 CFR 6.302(a) and Appendix A

This executive order requires Federal agencies to avoid, to the extent possible, the adverse impacts associated with the destruction or loss of wetlands and to avoid support of new construction in wetlands if a practical alternative exists. Alternatives that involve the alteration of a wetland may not be selected unless a determination is made that no practicable alternative exists. If no practicable alternative exists, potential harm must be minimized and action taken to restore and preserve the natural and beneficial values of the wetland.

Resource Conservation and Recovery Act (RCRA), Hazardous Waste Management System; (40 CFR Part 260)

This rule sets forth procedures that USEPA will use to make information available to the public, and sets forth rules that transfer storage and disposal facilities (TSDF) must follow to assert claims of business confidentiality with respect to information

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submitted to USEPA pursuant 40 CFR Parts 261-265. This rule creates no substantive clean-up requirements.

RCRA, 40 CFR Part 261, 261.1-261.33 - Identification and Listing of Hazardous Waste

This rule defines those solid wastes which are subject to regulation as hazardous wastes under 40 CFR Parts 262-265. The applicability of RCRA regulations to wastes found at the site is dependent on the solid waste meeting one of the following criteria:

- The wastes are generated through a RCRA listed source process;
- The wastes are RCRA listed waste from non-specific source; or
- The waste is characteristically hazardous due to ignitability, corrosivity, reactivity or toxicity.

RCRA, 40 CFR Part 262, Subparts A - D, 262.10-262.44 - Standards Applicable to Generators of Hazardous Waste

These rules establish standards for generators of hazardous wastes that address: accumulating waste, preparing hazardous waste for shipment, and, preparing the uniform hazardous waste manifest. These requirements are integrated with Department of Transportation (DOT) regulations. If an alternative involves the off-site transportation of hazardous wastes, the material must be shipped in proper containers that are accurately marked and labeled, and the transporter must display proper placards. These rules specify that all hazardous waste shipments must be accompanied by an appropriate manifest.

RCRA, 40 CFR Part 263 Subparts A - C, 263.10-263.31 - Standards Applicable to Transporters of Hazardous Waste

This rule establishes procedures for transporters of hazardous waste within the U.S. if the transportation requires a manifest under 40 CFR Part 262. If an alternative involves off-site transportation of hazardous waste for treatment and/or disposal, transporters must meet these requirements.

RCRA, 40 CFR - Part 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

This rule establishes minimum national standards which define the acceptable management of hazardous wastes for owners and operators of facilities which treat, store or dispose of hazardous wastes. Should remedial actions involve management of RCRA wastes at an off-site TSDF or if a treatment facility is constructed on-site, these requirements would be applicable.

RCRA, 40 CFR Subpart B, 264.10-264.18 - General Facility Standards

These general facility requirements outline general waste analysis, security measures, inspections, and training requirements. Section 264.18 establishes that a hazardous waste facility located in a 100-year floodplain be designed, constructed, operated, and maintained to prevent washout of hazardous wastes during a 100-year flood. An exception is if it can be demonstrated that current procedures can facilitate the safe removal of waste (before floodwaters would reach the facility) to a location where waste is not vulnerable to floodwaters. Should remedial actions involve management of RCRA wastes at an off-site TSDF, if a treatment facility is constructed on-site, or if the 100-year floodplain may be impacted, these requirements may be potentially relevant and appropriate ARARs.

RCRA, 40 CFR Subpart C, 264.30-264.37 - Preparedness and Prevention

This regulation outlines requirements for safety equipment and spill-control for hazardous waste facilities. Facilities must be designed, maintained, constructed, and operated to minimize the possibility of an unplanned release that could threaten human health or the environment. Safety and communication equipment should be incorporated into all aspects of the remedial process and local authorities should be familiarized with site operations.

RCRA, 40 CFR Subpart D, 264.30-264.37 - Contingency Plan and Emergency Procedures

This regulation outlines the requirements for emergency procedures to be used following explosions, fires, and other emergency events. These requirements are

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relevant and appropriate for remedial actions involving the management of hazardous waste.

RCRA, 40 CFR Subpart E, 264.70,72-77 - Manifest System, Recordkeeping, and Reporting

This rule outlines procedures for manifesting hazardous waste for owners and operators of on-site and off-site facilities that treat, store, or dispose of hazardous waste. These regulations apply if a remedial alternative involves the treatment, storage, or disposal of hazardous waste off-site. For on-site treatment/disposal, these regulations are applicable in order to properly document disposition of RCRA wastes.

RCRA, 40 CFR Sections 264.90-264.101, Subpart F - Releases from Solid Waste Management Units

The RCRA concentration limits (40 CFR Section 264.94) are potentially applicable and establish three categories of groundwater protection standards: background concentrations, RCRA MCLs, and Alternate Concentration Limits (ACLs). RCRA MCLs consist of a subset of SDWA MCLs; therefore, in complying with SDWA MCLs, clean-up will be consistent with RCRA MCLs. If no MCL exists, a background level or a health-based (i.e., assuming human exposure) ACL may be developed on a case-by-case basis as a groundwater protection standard. ACLs are based on the contaminant level's potential adverse effects on groundwater quality and on hydraulically connected surface waters, considering factors such as (1) physical and chemical characteristics of the waste, (2) hydrogeological characteristics of the setting, (3) groundwater flow quantity and direction, (4) current and future groundwater uses, (5) existing quality of area groundwater, and (6) persistence and permanence of adverse effects. Additional factors are listed in 40 CFR Section 264.94. This rule is relevant and appropriate for cleanup of groundwater contamination at facilities holding a RCRA Part B permit for the treatment, storage, and disposal of hazardous waste.

RCRA, 40 CFR Subpart G, 264.110-264.120 - Closure and Post-Closure

This regulation details general requirements for closure and post-closure of hazardous waste facilities, including installation of a groundwater monitoring program. This rule is a potential relevant and appropriate ARAR for remedial alternatives that involve the closure of a hazardous waste site. If a RCRA Part B permitted site is in the process of closure and post-closure of SWMUs, this regulation would be applicable.

RCRA, 40 CFR Subpart I, 264.170-264.178 - Use and Management of Containers

This requirement defines standards for the containerized storage of hazardous waste. This requirement would apply if a remedial alternative involves the storage of containers filled with hazardous waste. Additionally, the staging of study-generated RCRA-wastes should meet the intent of the regulation.

RCRA, 40 CFR Part 264.190-264.199, Subpart J - Tank Systems

These regulations outline design standards and leak detection measures for aboveground and underground storage tanks used for storing or treating hazardous waste. These regulations include requirements for assessing existing tank systems, design and installation of new tank systems, containment and detection of release, general operations, inspections, response to leaks or spills, and closure and post-closure care. These requirements must be considered underground storage tanks, and, if applicable, complied with during implementation of remedial activities.

RCRA, 40 CFR Subpart K, 264.220-264.231 - Surface Impoundments

There are three basic closure options for surface impoundments. The clean-closure option requires removal or decontamination for all hazardous constituents; it includes very stringent groundwater standards for clean-up levels. If all hazardous constituents will not be removed or decontaminated, the landfill closure option may be used. Landfill closure is a containment option and requires a final cover or cap and a post-closure plan that protects human health and the environment.

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Should a remedial action involve the placement of hazardous wastes in surface impoundments (e.g., lagoons for the treatment and/or storage of extracted water/groundwater), this regulation would be relevant and appropriate.

RCRA, 40 CFR Part 264, Subpart L, Waste Piles

This rule establishes procedures and operating requirements for both closure and post-closure of waste piles. If removal or decontamination of all contaminated subsoils is not possible, closure and post-closure requirements for landfills must be attained. Should a remedial action involve the placement of hazardous wastes in surface impoundments (e.g. lagoons for the treatment and/or storage of extracted water/groundwater), this regulation would be relevant and appropriate. According to RCRA, waste piles used for treatment or storage of non-containerized accumulation of solid, non-flowing hazardous waste may comply with either the waste pile or landfill requirements. The temporary storage or treatment of hazardous waste on-site, therefore, should meet the substantive requirements of one or the other subpart.

RCRA, 40 CFR Part 264, Subpart M - Land Treatment

This rule details procedures, design, and operating requirements, monitoring requirements, recordkeeping, and closure and post closure requirements for land treatment units. Any facility employed in the treatment of hazardous waste should meet the substantive construction, monitoring, operational, and closure standards established within this regulation.

RCRA, 40 CFR Sections 264.300-264.317, Subpart N - Landfills

This regulation covers design and operating requirements, and closure and post-closure options for hazardous waste landfills. These requirements must be considered and complied with during the development and implementation of remedial alternatives for the site landfills to contain hazardous waste. If closure is implemented as a remedial action, a final cover must be designed and constructed that prevents migration of liquids, requires minimum maintenance, promotes drainage, minimizes erosion, accommodates settling, and has a permeability less than or equal to that of any bottom liner or natural subsoils present.

RCRA, 40 CFR Subpart O, 264.340-264.599 - Incinerators

This regulation specifies the performance standards, operating requirements and monitoring, inspection, and closure guidelines of any incinerator burning hazardous waste. These requirements are applicable for the off-site incineration of RCRA-regulated wastes. For alternatives employing on-site thermal treatment (i.e., incineration) of RCRA wastes should comply with the requirements specified in this subpart of RCRA.

RCRA, 40 CFR Subpart X, 264.600-264.999 - Miscellaneous Units

These standards are applicable to miscellaneous units not previously defined under existing RCRA regulations. Subpart X outlines performance requirements that miscellaneous units be designed, constructed, operated, and maintained to prevent releases to the subsurface, groundwater, and wetlands that may have adverse effects on human health and the environment. The design of proposed treatment alternatives, not specifically regulated under other subparts of RCRA, must prevent the release of hazardous constituents and must prevent future impacts on the environment.

RCRA, 40 CFR Part 266 - Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities

Part 266 deals with both recycling/reuse activities and types of wastes being recycled or reused. Five types of recycling/reuse are included:

- Subpart C - Applies to materials that in the process of being recycled are applied. These materials can be referred to as "use constituting disposal". The regulatory requirements for these actions are very similar to the requirements for land disposal.
- Subpart E - Applies to used oil burned for energy recovery. The substantive requirements apply only to used oil that exceeds specified limits for heavy metals, flash point, and total halogens.
- Subpart F - Applies to precious metal wastes that are processed for metal recovery. These requirements are administrative only.

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Subpart G - Applies to spent lead-acid batteries that are being reclaimed. Only storage facilities for spent lead-acid batteries are regulated under this subpart.

Subpart H - Applies to hazardous wastes that are burned in boilers and industrial furnaces. Permitting requirements, emission standards, minimum storage requirements, record keeping, and operating requirements are established for this activity.

RCRA, 40 CFR Part 268 - Land Disposal Regulations (LDRs)

This regulation details procedures, design and operating requirements, monitoring requirements, recordkeeping, and closure and post-closure for land treatment units. Any land treatment facility employed in the treatment of hazardous waste should meet the construction, monitoring, operational, and closure standards established within this regulation.

Land disposal of RCRA hazardous wastes without prior treatment is prohibited. Waste at specific sites must be evaluated as to whether it meets the definition of one of the specified restricted wastes and the remedial action must constitute "placement" for the land disposal restrictions to be considered applicable. For each hazardous waste, the LDRs specify that the waste must be treated either by a treatment technology or to a concentration level prior to disposal in a RCRA Subtitle C permitted facility. Under the LDRs, treatment standards have been established for all listed wastes. If it is determined that hazardous wastes at the site are considered subject to LDRs, the material must be handled and treated in compliance with these regulations. To date, treatment standards for hazardous soil and debris (CSD) have been proposed, but not promulgated; however, if CSD fails the Toxicity Characteristic Leaching Procedure (TCLP) test, and are thus characteristically hazardous, disposal of treated wastes in a RCRA-permitted unit would be required.

RCRA, Land Disposal Restrictions for Newly Listed Wastes and Hazardous Debris, 40 CFR Parts 148, 260, 261, 262, 265, 270 and 271

Contaminated debris can now be managed so that treated, cleaned debris may be disposed as non-hazardous waste. The treatment residual of the original contaminant remains a hazardous waste and must be disposed as such. Under this new rule,

debris must be treated to the performance or design and operating standards by a specified extraction or destruction technology identified in the rule, and it cannot exhibit a characteristic of hazardous waste. Residuals generated by the treatment of hazardous debris are subject to the numerical treatment standards for the waste which contaminated the debris.

A new waste management unit, a containment building, is established as part of this rule. This new unit allows wastes to be stored for up to 90 days without meeting treatment standards. Containment buildings granted 90-day status must meet the same substantive standards as permitted and interim status units.

Containment buildings are authorized for storage of dry wastes or wastes containing "very small quantities" of free liquids. Acceptable activities within the unit include storage of hazardous waste for treatment (including recovery and recycling) or transport off-site. Design and operating standards are promulgated in the rule to ensure containment of waste that is equivalent to the containment achieved by tanks.

RCRA, 40 CFR Part 270, Hazardous Waste Permit Program

This rule establishes provisions covering basic USEPA permitting requirements. RCRA permitting requirements need to be determined on a case-by-case basis, working with all involved regulatory agencies. However, any activity involving the treatment or containment of hazardous waste is subject to these permitting requirements.

RCRA, 40 CFR Part 280 - Underground Storage Tanks (USTs)

These regulations apply to USTs used to store "regulated substances," which are substances defined in Section 101(14) of CERCLA. The regulations do not apply to hazardous waste USTs.

Each UST must be properly designated and constructed. Any portion underground and any piping that routinely contains regulated substances must be protected from corrosion, in accordance with a code of practice developed by a nationally recognized association or independent testing laboratory, as specified in the regulation. To prevent spilling and overfilling associated with product transfer to the UST, required spill and overfill prevention equipment must be used. All existing USTs must comply

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with the new UST system performance standards, be upgraded, or undergo closure no later than December 22, 1998.

Additional requirements pertain to general operations (Subpart C), release detection (Subpart D), and release reporting investigation and confirmation (Subpart E). Of particular importance are the requirements under Subpart F (i.e., Release Response and Corrective Action for UST Systems Containing Petroleum of Hazardous Substances). Upon confirmation of a release, certain activities must take place, including an initial response, initial abatement measures and site check, initial site characterization, free-product removal, investigations for soil and groundwater clean-up, and a corrective action plan. To permanently close a UST, the requirements of Subpart G are applicable. The UST must be emptied and cleaned, and either removed or filled with an inert solid material. The site must be assessed for contamination at closure.

If it is determined that an UST at the site is the source of contamination and must be closed, these regulations must be attained when developing and implementing remedial alternatives.

RCRA, Hazardous and Solid Waste Amendment, 1984 (HSWA) Section 3004 (u) and (v) - Corrective Action Requirements

RCRA requirements which apply to alternatives involving off site treatment or disposal and are relevant and appropriate to on site treatment approaches include: standards for owners and operators of permitted hazardous waste facilities (i.e. preparedness and prevention, contingency plan and emergency procedures, recordkeeping and reporting, and groundwater monitoring). In addition, these alternatives should meet the intent of RCRA closure and post-closure requirements. Releases of RCRA hazardous constituents into all media, on- or off-site, are subject to the HSWA. Because the corrective action requirements are only now being developed by USEPA, CERCLA remedial actions must continue to operate within the RCRA requirements.

Rivers and Harbors Act, Section 10

Section 10 of the Rivers and Harbors Act prohibits the unauthorized obstruction or alteration of any navigable water of the United States. This law would be applicable

during any remedial activity which involved dredge-and-fill activities which could potentially affect navigable waters.

SDWA, 40 CFR Part 141 - National Drinking Water Regulations; Maximum Contaminant Level Goals

The SDWA MCLGs are ARARs for aquifers and related groundwater used as a potable water supply source. MCLGs are nonenforceable health goals established by USEPA, however, the 1990 NCP recognizes MCLGs as potential ARARs. MCLGs are used in cases in which multiple contaminants or pathways of exposure present extraordinary risks to public health. In such cases, USEPA makes a site-specific determination of the more stringent standards. Non-zero MCLGs are considered potential relevant and appropriate ARARs for groundwater used as a current or potential source of drinking water. The NCP established that MCLGs equal to zero are not appropriate for setting cleanup levels. In those circumstances the corresponding MCL will be the potentially relevant and appropriate requirement. An example of this approach is found in determining potential ARARs for copper and lead. The MCLG for copper is set at 1300 $\mu\text{g/l}$, which is therefore the potential relevant and appropriate ARAR for copper. The MCLG for lead, on the other hand, was set at zero, which is not considered to be an "appropriate" standard for CERCLA cleanups. MCLGs are never applicable requirements at CERCLA sites because they are not enforceable. As discussed under MCLs, MCLGs could also be considered potential ARARs for surface water if the water bodies under consideration are not current or potential sources of drinking water.

SDWA, 40 CFR Part 141 - National Drinking Water Regulations, Maximum Contaminant Levels

The SDWA MCLs are legally enforceable federal drinking water standards. MCLs are commonly identified as ARARs for existing or potential future drinking water sources. However, MCLs would only be applicable where water at a CERCLA site is delivered through a public water supply system; they would be relevant and appropriate ARARs for existing or potential drinking water sources where it is not part of a public water system. MCLs could also be potential ARARs for surface waters if the surface water bodies on or potentially affected by the site not current or potential sources of drinking water.

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SDWA, 40 CFR Part 143 - National Secondary Drinking Water Standards (SMCLs)

This regulation establishes SMCLs, which are non-enforceable limits intended as guidelines for use by States in regulating water supplies. These values are listed in Table A-1 under the Federal MCL column. Secondary drinking water criteria are identified with a "(2)" following the number.

SDWA, 40 CFR Parts 144, 146, 147, 1000 - Underground Injection Control Regulations

These regulations outline minimum program and performance standards for underground injection programs. Technical criteria and standards for siting, operation and maintenance, and reporting and recordkeeping as required for permitting are set forth in Part 146. This rule also provides for protection of underground sources of drinking water. Discharge of treated groundwater, by well injection, must be in accordance with all criteria and standards in these federal regulations, as well as meet all state Underground Injection Control Program requirements. Treated groundwater must meet all SDWA standards prior to well injection.

Solid Waste Disposal Act, Criteria for Classification of Solid Waste Disposal Facilities and Practices; (42 U.S.C. 6901-6987, 40 CFR Part 257)

This rule establishes criteria for use in determining which solid waste disposal facilities and practices pose a reasonable probability of adverse effects on human health or the environment and thereby constitute prohibited open dumps. If a remedial alternative involves on-site disposal, all limitations of this regulation must be met.

FEDERAL GUIDELINES TO BE CONSIDERED

USEPA Health Assessment Documents, Acceptable Intake, Chronic (AIC) and Subchronic (AIS)

The Acceptable Intake - Chronic and Acceptable Intake - Subchronic health assessment documents provide values developed for the Reference Doses (RfDs) and Health Effects Assessments (HEAs) for noncarcinogenic compounds. AIC and AIS values characterize the risks from these contaminants. This material provides guidance for assessing chronic and subchronic risks for noncarcinogenic compounds.

USEPA Human Health Assessment Cancer Slope Factors (CSFs)

Cancer Slope Factors are developed by the USEPA from HEA, or evaluation by the Human Health Assessment Group (HHAG). These values present the most up-to-date cancer risk potency information. HHAGs compute the individual cancer risk resulting from exposure to contaminants.

USEPA Office of Drinking Water, Health Advisories (HAs)

USEPA HAs are chemical concentrations based on estimates of risks due to consumption of contaminated drinking water. The HAs consider noncarcinogenic effects only, and should be considered for contaminants in groundwater used for drinking water.

Health advisories are estimates of risk due to consumption of contaminated drinking water. These advisories should be considered for contaminants in surface and groundwater which is or could potentially be used as a potable water source.

USEPA Reference Concentrations (RfCs)

RfCs are concentration levels developed by the USEPA for non-carcinogenic effects for lifetime exposure. RfCs values represent levels that, most likely, do not cause adverse effects to humans via inhalation of chemicals. RfCs are used to characterize

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risks of soil and groundwater contaminant exposure (for the inhalation exposure scenario).

USEPA Reference Doses

USEPA RfDs are dose levels also developed for noncarcinogenic effects. RfDs are considered the levels unlikely to cause significant adverse health effects associated with a threshold mechanism of action in human exposure. RfDs are typically employed to characterize risks of soil and groundwater contaminant exposure for the dermal contact and ingestion pathways.

USEPA Office of Water Guidance, Water Related Fate of 129 Priority Pollutants (1979)

Presents chemical-specific fate and transport information for 129 priority pollutants. This document provides guidance to support the determination of contaminant fate and transport and is relevant to the site characterization, risk assessment, and fate and transport modelling components of the RI.

Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites; [OSWER Directive #9355.4-02]

Sets forth interim soil cleanup levels for lead in lieu of any USEPA verified toxicological values. Interim guidance recommends a cleanup level for total lead of 500 to 1,000 mg/kg. Site-specific conditions may warrant levels lower than 500 mg/kg, based on the exposure assessment.

**APPENDIX A.2: SUMMARY OF WISCONSIN ARARS
AND ADMINISTRATIVE CODE**

Chapter NR 100: Environmental Protection

Chapter 100 outlines the discharge limits for both organic and inorganic mercury into State waters.

Chapter NR 102: Water Quality Standards for Wisconsin Waters

In conjunction with NR 103 to NR 105, this chapter establishes water quality standards for surface waters in the State of Wisconsin. This chapter describes the designated use categories for waters of the State and water quality criteria necessary to support these uses. The waters of the state are classified into fish and aquatic life categories described below:

- **Great Lakes Communities;** these waters include Lake Superior, Lake Michigan, and Green Bay and all associated bays, inlets, and spawning areas for anadromous fish species.
- **Cold Water Communities;** waters other than the Great Lakes communities which include surface waters capable of supporting cold water fish and other aquatic life or serving as a spawning area for such fish.
- **Warm Water Sport Fish Communities;** surface waters capable of supporting a community of warm water sport fish or serving as a spawning area for such fish.
- **Warm Water Forage Fish Communities;** surface waters capable of supporting abundant forage fish and other aquatic life.
- **Limited Forage Fish Communities;** surface waters of limited capacity and naturally poor water quality or habitat, capable of supporting only a limited community of forage fish and other aquatic life.

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- **Limited Aquatic Life;** surface waters of severely limited capacity and naturally poor water quality or habitat which are capable of supporting only a limited community of aquatic life.

NR 102 states that all waters must meet the following conditions at all times and for all flow conditions:

- Substances which cause objectionable deposits on the shore or in the bed of a body of water must not be present;
- floating or submerged debris, oil, scum, or other material must not be present; and
- materials which produce color, odor, taste, or unsightliness may not be present in amounts which interfere with public uses in state waters.
- Substances which are toxic or harmful to humans may not be present in amounts which are a significant public health threat or which are acutely harmful to animal, plant or aquatic life.

Section NR 102.04(4) establishes the following criteria for all waters classified for fish and aquatic life:

- Dissolved oxygen content in the surface waters may not be lowered to less than 5 mg/L unless a variance is granted in accordance with Section NR 104.02(3).
- Temperature changes may not be so extreme that they adversely affect aquatic life. The maximum temperature rise at the edge of the mixing zone above the existing natural temperature may not exceed 5°F for streams and 3°F for lakes. The maximum allowable water temperature for warm water fish is 89°F.
- The range of pH must be within 6.0 to 9.0 with no change greater than 0.5 units outside seasonal minimum or maximum.
- Unauthorized concentrations of substances which are toxic to fish or aquatic life are not permitted.

- Streams classified as trout waters or as great lakes or cold water communities may not be altered so as to affect background temperature and dissolved oxygen levels.

Section 102.14 sets threshold concentrations for several substances causing taste and odor in water.

Chapter NR 103: Water Quality Standards for Wetlands

These regulations establish water quality standards for wetlands. The rule outlines the conditions necessary to protect water quality related functions and values of wetlands. To this end, the rule specifies that water quality values which must be protected include:

- storm and flood water storage and retention of water level fluctuation extremes;
- hydrologic function including the maintenance of dry season stream flow, discharge of groundwater to a wetland, recharge of groundwater from a wetland to another area, and the flow of groundwater through a wetland;
- filtration or storage of sediments, nutrients, or toxic substances that would have an adverse impact on other the quality of other state waters;
- shoreline protection against erosion through the dissipation of wave energy and water velocity and anchoring of sediments;
- habitat for aquatic organisms in the food web;
- habitat for resident and transient wildlife species; and
- recreational, cultural, educational, scientific, and natural aesthetic values and uses;

Wetland functional values and the impact of a proposed activity upon those values is determined using standardized wetland ecological methods such as:

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- Wetland Evaluation Techniques (FHWA/COE);
- Wisconsin Wetland Evaluation Methodology;
- Hollands-Magee (IEP/Normandeau);
- Minnesota Wetland Evaluation Methodology for North Central United States; and the
- Wisconsin Department of Natural Resources Rapid Assessment Method.

Chapter NR 104: Uses and Designated Standards (formerly Intrastate Waters - Uses and Designated Standards)

Surface water classifications and effluent limitations are established in this rule. Classification by hydrologic characteristics includes the hydrologic description of lakes, diffused surface waters, wetlands, wastewater effluent channels, noncontinuous streams, and continuous streams. Effluent limitations for surface waters significant to the environmental integrity of the state or classified for fish and aquatic life, and wastewater treatment lagoons are also defined.

Chapter NR 106: Wisconsin Water Quality Standards: Procedures for Calculating Water-quality-based Effluent Limitations for Toxic and Organoleptic Substances Discharged to Surface Water

Wisconsin procedures for calculating effluent limitations are applicable to point sources that discharge wastewater containing toxic or organoleptic substances to surface waters. These regulations outline the calculations and data requirements necessary to calculate effluent limitations. If an alternative proposes to discharge treated groundwater at surface water body at BAAP, these requirements may apply.

Chapter NR 108: Wisconsin Water Quality Standards: Requirements for Plans and Specifications Submittal for Renewable Projects and Operations of Community Water Systems, Sewerage Systems, and Industrial Wastewater Facilities

This rule establishes protocols for plan reviews and standards for treatment facilities in order to meet effluent standards.

Chapter NR 109: Wisconsin Water Quality Standards: Safe Drinking Water

This rule establishes water quality standards for potable water. These standards apply to all new and existing public water systems. Public water system, under the definition provided in this rules, means any system that has at least 15 service connections. Because BAAP waters are not used as a drinking water source, this rule will not be considered during the FS and remedial actions.

Chapter NR 115: Wisconsin's Shoreland Management Program

Chapter NR 115 requires counties to establish shoreland ordinances for all unincorporated shoreland areas. Shorelands are defined as the areas within 1,000 feet of a lake, pond, or flowage, or within 300 feet of rivers or streams or the floodplain. Each county must adopt regulations that meet or exceed minimum state standards to protect water resource values: natural beauty, water quality, recreation and navigation, and fish and wildlife. At a minimum, the ordinances must include (1) minimum lot sizes; (2) building setbacks from property lines and waterways; (3) controls on cutting trees and shrubbery; (4) standards for filling, grading, lagooning, dredging, ditching, and excavating; and (5) restrictions on improvements to older structures or uses that do not meet shoreland standards.

As specified in Chapter NR 115, Sauk County has adopted the Sauk County Shoreland Protection Ordinance (Sauk County Code of Ordinances, Chapter 8). This ordinance defines minimum lot sizes, building setbacks, restrictions to existing structure modification, controls on tree cutting, standards for fill, grading, lagooning, dredging, ditching, and excavating. This regulation may be applicable if any site-specific FS actions involved any of these activities at defined shorelands or wetlands. The shorelands/wetlands district includes all shorelands within the jurisdiction of this ordinance which are wetlands of 5 acres or more, (excluding point symbols) and which are shown on the Wisconsin Wetland Inventory Maps that are adopted and

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made a part of this ordinance. A portion of a wetland which is less than 5 acres in size, and which is located in the unincorporated shoreland area within the county, shall be included in the shoreland/wetland district where the wetland as a whole is 5 acres or larger, but extends across the corporate limits of a municipality, across the county boundary or across the shoreland limits, so that the wetland is not regulated in its entirety by the county.

If an existing town shorelands ordinance is more restrictive than the County ordinance, the town ordinance prevails in respect to the greater restrictions but not otherwise.

Specifically, regarding setbacks, "Unless an existing development pattern exists, a setback of 75 feet from the ordinary high-water mark of an adjacent body of water to the nearest part of a building or structure shall be required for all building and structures, except piers, boat hoists, and boathouses."

Chapter NR 116: Wisconsin's Floodplain Management Program

This chapter regulates all construction activities in the floodplain. Any construction activity must be evaluated for impact on upstream flooding. Generally, no activities are allowed in the "floodway" including solid or hazardous waste disposal.

Chapter NR 117: Wisconsin's City and Village Shoreland-Wetland Protection Program

Chapter NR 117 requires cities and towns to establish shoreland-wetland zoning ordinances that create shoreland-wetland zoning districts for all wetlands of 5 acres or more, located in shorelands within the incorporated area of the city or village. The state, with input from cities and villages, developed inventory maps showing the location and type of all wetlands. Cities and villages have the option of zoning any wetland within their incorporated area, including wetlands that are smaller than 5 acres in size.

The State of Wisconsin defines a wetland as an area in which water is at, near, or above the land surface long enough to be capable of supporting aquatic or hydrophytic vegetation and which has soils indicative of wet conditions. The

shoreland zone is defined as the area within 1,000 feet of a lake, pond, or flowage, or within 300 feet of a stream or the floodplain, whichever is greater.

Although local governments may enact more restrictive standards, the state permits the following uses in wetlands:

- recreation, such as hunting, fishing, trapping, and hiking
- forestry, including limited water level manipulation and some road construction
- harvesting of wild crops
- pasturing of livestock, including fence construction
- agricultural cultivation, including maintenance of existing drainage systems
- some limited construction of small buildings needed to support open space or wetland preservation uses
- pier, dock, and walkway construction
- development of parks, recreation areas, and fish and wildlife habitat improvement projects
- limited utility construction
- limited road construction for farming and forestry
- limited railroad construction

Some additional uses are allowed in cities and villages. Every shoreland-wetland zoning ordinance or zoning code must provide a system to issue land use or building permits.

Potential wetlands have been identified at five BAAP sites. Shoreland-wetland requirements will be addressed for those remedial alternatives evaluated during the FS process involving land use or construction within a wetland zoning district.

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Chapter NR 140: Wisconsin Groundwater Quality Standards

Wisconsin groundwater quality standards apply to virtually all facilities, activities, and practices regulated by the state which may affect groundwater quality. Chapter NR 140 encompasses the following relevant areas:

- (1) it establishes two separate numerical standards for a wide group of pollutants. These are enforcement standards and preventative action limits (PALs) (Chapter NR 140.10 and Chapter NR 140.12).
- (2) it specifies scientifically valid procedures for determining if a numerical standard has been attained or exceeded (Chapter NR 140.14);
- (3) it specifies procedures for establishing points of standards compliance [Wisconsin Administrative Code (WAC), Chapter NR 140.22]; and,
- (4) it establishes sets of ranges of responses required if a groundwater standard (PAL or enforcement standard is attained or exceeded [Chapters NR 140.24, NR 140.26, and NR 140.27]).

Under Chapter NR 140, two separate standards, an enforcement standard and a PAL, were developed for public health (NR 140.10) and public welfare (NR 140.12). Enforcement standards are set at concentrations greater than PALs.

PALs are developed by using a percentage of enforcement standards (i.e., 10 percent for carcinogenic compounds and 20 percent for noncarcinogenic compounds), and must be achieved if technically and economically feasible. The feasibility of complying with a PAL is determined on a case-by-case basis.

According to NR 140.22, when designing a facility, enforcement standards and PALs can be applied at the following locations:

- any point of current groundwater use
- any point beyond the boundary of the property on which the facility, practice, or activity is located
- any point within the property boundaries beyond the three-dimensional design management zone if one is established by Wisconsin

Department of Natural Resources (WDNR) at each facility, practice, or activity

For spills, discharges, and other remedial response actions, the point of standards application is every point at which groundwater is monitored to determine if a PAL or enforcement standard has been attained or exceeded.

Sections NR 140.24 and NR 140.26 delineate the range of remedial responses required after verification that PALs and enforcement standards are exceeded, respectively. In both sections, notification and evaluation criteria are presented. The difference in response requirements between NR 140.24 and NR 140.26 mainly are that WDNR, under NR 140.24, has the latitude to require no action, additional sampling, or further testing/study actions if a PAL is exceeded or attained. Under NR 140.24 the WDNR may also require the following responses:

- Revise the operational procedures at the facility, practice, or activity.
- Change the design or construction of the facility, practice, or activity.
- Develop an alternate method of waste treatment or disposal.
- Prohibit or close and abandon a facility, practice, or activity.
- Conduct a remedial action to renovate or restore groundwater quality.
- Revise rules or criteria on facility design, location, or management practices.

Under Chapter NR 140.26, if a determination is made that an enforcement standard is violated at a point of compliance WDNR requires one of the above actions with no exceptions (i.e., no provision for a no-action response).

Section NR 140.27 states that attainment or exceedance of an enforcement standard at a point other than a point of compliance requires a response the same as for NR 140.24.

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Chapter NR 200: Wisconsin Water Pollution Control Regulations: Applications for Discharge Permits

Permits are required for discharges of pollutants from point sources to surface waters and to land areas where pollutants may percolate, seep to, or be leached to groundwaters. Definitions are provided for in the Water Pollution Control Regulations (Parts 200-239) and describes the requirements for discharge permits.

Chapter NR 205: Wisconsin Water Pollution Regulations: General Provisions

Wisconsin Pollutant Discharge Elimination System (WPDES) permit program is similar to the federal NPDES program under the CWA. Discharge of pollutants to waters of the state is prohibited without a valid WPDES permit. WDNR may impose monitoring, recordkeeping, and reporting requirements on the WPDES permit. Discharge standards are generally determined by the state on a case-by-case basis.

Chapter NR 215: Wisconsin Water Pollution Control Regulations: List of Toxic Pollutants

A list of toxic pollutants is provided in this chapter. According to the requirements of Chapter 147, Stats., all discharges containing these pollutants must not contain quantities of these pollutants which are greater than the amount which would remain after the discharge had received treatment by the best available technology economically achievable. Also, the quantities may also not exceed any lesser quantity necessary to provide an ample margin of safety, as determined by WDNR. Nearly all of the listed contaminants of concern for BAAP are included in this list of toxic pollutants.

Chapter NR 218: Wisconsin Water Pollution Control Regulations: Method and Manner of Sampling

This chapter provides the methods and manner for collection of effluent samples to comply with the monitoring requirements established in chapter 147, Stats., and WPDES permits. Methods for measuring flow rate, calibration of flow measuring devices, location of sampling points, and size and storage of samples is addressed.

Chapter NR 219: Wisconsin Water Pollution Control Regulations: Analytical Test Methods and Sampling Procedure

Analytical test methods, preservation procedures, requirements for laboratories, and procedures applicable to effluent limitations for discharges point sources are established in this chapter.

Chapter NR 220: Wisconsin Water Pollution Control Regulations: Categories and Classes of Point Sources and Effluent Limitations

Categories and classes of point sources and effluent limitations are established in this rule. This chapter also lists industries for which standards have been established. Explosives manufacturing is included in this list.

Chapter NR 400: Wisconsin General and Portable Sources Air Pollution Control Rules: Air Pollution Control Definitions

Definitions for Chapters NR 400 to 499 are included in this chapter.

Chapter NR 404: Wisconsin General and Portable Sources Air Pollution Control Rules: Ambient Air Quality Standards

Under WAC, Chapter NR 404, Wisconsin established primary and secondary ambient air quality standards for sulfur oxides, suspended particulates, carbon monoxide, ozone, nitrogen dioxide, lead, and particulate matter with an aerodynamic diameter less than or equal to a nominal PM₁₀. The primary air standard is the level of air quality that provides protection for public health with an adequate margin of safety. The secondary air standard is the level of air quality that may be necessary to protect public welfare from unknown or anticipated adverse effects.

The secondary standard for total suspended particulates is 150 $\mu\text{g}/\text{m}^3$, maximum 24-hour average concentration, not to be exceeded more than once a year. The primary and secondary standards for lead and its compounds, measured as elemental lead, are 1.5 $\mu\text{g}/\text{m}^3$, maximum arithmetic mean average over a calendar quarter, as a constituent of suspended particulate matter. The primary and secondary standards

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for PM_{10} are (1) $50 \mu\text{g}/\text{m}^3$, annual arithmetic mean concentration, and (2) $150 \mu\text{g}/\text{m}^3$, maximum 24-hour average concentration. Sulfur dioxide and nitrogen dioxide releases to the atmosphere may be of concern if soils contaminated with nitrates or sulfates are incinerated. The primary standards for sulfur oxides, measured as sulfur dioxide, are $80 \mu\text{g}/\text{m}^3$, annual arithmetic mean, and $365 \mu\text{g}/\text{m}^3$, maximum 24-hour average not to be exceeded more than once per year. The secondary standard is $1,300 \mu\text{g}/\text{m}^3$, maximum 3-hour average concentration, not to be exceeded more than once per year. The primary and secondary standards for nitrogen dioxide are $100 \mu\text{g}/\text{m}^3$, annual arithmetic mean. The standards may be applicable during excavation, incineration of soils, and construction-related activities at BAAP.

Chapter NR 406 and NR 409: Wisconsin General and Portable Sources Air Pollution Control Rules: Construction or Modification and New Operation Permits

Chapter NR 406 requires permits for construction or modification of stationary sources of air pollution and operation of new stationary sources. Section NR 406.04 identifies specific and general categories of sources exempt from the permit requirements. Specific categories of exempt sources include but are not limited to (1) certain fuel-burning equipment that does not burn hazardous waste; (2) equipment designed to burn solid wastes, which are not pathological wastes or hazardous wastes, at a rate of not more than 500 pounds per hour; (3) storage tanks containing petroleum liquid or organic compounds that are not volatile organic compounds (VOCs), with a maximum capacity of not more than 40,000 gallons; and (4) VOC storage tanks with a maximum capacity of not more than 10,000 pounds.

The regulations also include a general category of exempt sources, and identify certain pollutants and standards that may not be exceeded without considering pollution control equipment in order for the source to be exempt from the permit requirements. The exemptions apply when the following conditions exist:

- The source will not emit sulfur dioxide, carbon monoxide, or nitrogen oxides at a rate of more than 9 pounds per hour for each pollutant emitted, without considering pollution control equipment.
- The source will not emit particulate matter or organic compounds at a rate of more than 5.7 pounds per hour for each pollutant emitted, without considering pollution control equipment.

- The source will not emit PM₁₀ at a rate of more than 3.4 pounds per hour, without considering pollution control equipment.
- The source will not emit any of the following air contaminants at a rate greater than the applicable emission rate listed:
 - fluorides, 3 tons per year
 - hydrogen sulfide, 10 tons per year
 - reduced sulfur compounds, 10 tons per year
 - total reduced sulfur, 10 tons per year
 - vinyl chloride, 1 ton per year
- The source's potential emissions at full capacity, without considering pollution control equipment, of any hazardous air contaminant listed in Chapter NR 445.04 are not greater than the emission rate listed.
- The source will not emit any air contaminant at a rate of more than 6 pounds per hour for each pollutant emitted, without considering pollution control equipment.

Under WAC, Chapter NR 409, a new permit must be obtained when a portable source is relocated to a new site. Portable sources are subject to the same exemptions for new stationary sources listed under Chapter NR 406.

Chapter NR 415: Wisconsin Particulate and Sulfur Emissions Rules: Control of Particulate Emissions

Chapter NR 415 applies to all air contaminant sources and requires precautions to be taken to prevent particulate matter from becoming airborne. Examples of precautions include but are not limited to use of water or chemicals for control of dust, application of plastic covering on material stockpiles and surfaces which can create airborne dust, or covering or securing of materials likely to become airborne while being moved on public roads. WAC, Chapter NR 415.05 specifies particulate emission limits for certain processes. In addition, particulate emissions limits were developed for fuel-burning equipment and incinerators (Chapters NR 415.06 and NR 415.07, respectively), depending on unit specifications. In particular, the limit for incinerators on which construction commenced after April 1, 1972, and which are rated at 4,000 pounds of waste per hour or more, is 0.15 pounds of particulate per

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1,000 pounds of exhaust gas. The limit for incinerators rated at over 500 pounds and less than 4,000 pounds of waste per hour is 0.21 pounds of particulate per 1,000 pounds of exhaust gas. For incinerators rated at 500 pounds of waste per hour or less, other than prefabricated domestic incinerators below a 5-cubic-foot capacity, the limit is 0.30 pounds of particulate matter per 1,000 pounds of exhaust gas. Prefabricated domestic incinerators below a 5-cubic-foot capacity must not exceed the performance emission requirements prescribed by the United States of America Standards Institute for domestic incinerators (Standard Z21.6).

Chapter NR 419: Wisconsin Organic Compound Emissions Rules

Chapter NR 419 requires that reasonable precautions be taken when handling organic compounds to prevent spillage or escape or emission of organic compounds, solvents, or mixtures. In addition, no person may dispose of more than 5.7 liters of any liquid VOC waste, or any liquid, semisolid, or solid waste materials containing more than 5.7 liters (1.5 gallons) of any VOC, in any one day from a facility in a manner that would permit evaporation into the ambient air during the ozone season. This includes but is not limited to the disposal of VOCs that must be removed from VOC control devices so as to maintain the devices at the required operating efficiency.

The quantity of VOCs that evaporates into the ambient air during the ozone season must not exceed 15 percent (by weight) or 5.7 liters in any one day, whichever is larger. If remedial actions could result in the release of VOCs to the atmosphere, such as could occur during air stripping, this regulation will be considered.

Chapter NR 422: Control of Organic Compound Emissions from Surface Coating, Printing, and Asphalt Surfacing

This chapter establishes requirements for the control of emissions resulting from surface coating and printing processes and for the use of cutback asphalts for surfaces intended for use by motor vehicles, bicycles, and pedestrians. May be applicable if hot mix asphalt is selected as a remedial alternative.

Chapter NR 426: Wisconsin Carbon, Lead, and Nitrogen Emission Rules: Control of Carbon Monoxide Emissions

Chapter NR 426 states that carbon monoxide may not be emitted into the ambient air in concentrations which contribute substantially to exceeding of an air standard or which cause air pollution. New direct sources may not release significant emissions of carbon monoxide unless these emissions are subjected to incineration at 1,300°F for 0.3 seconds. The concentration of carbon monoxide can also be reduced by some other means to an equivalent amount.

Chapter NR 427: Wisconsin Carbon, Lead, and Nitrogen Emission Rules: Control of Lead Emissions

This chapter states that lead or lead compounds cannot be emitted to the ambient air in quantities that exceed an air standard or air increment, or which creates air pollution.

Chapter NR 428: Wisconsin Carbon, Lead, and Nitrogen Emission Rules: Control of Nitrogen Emissions

Chapter NR 428 states that nitrogen oxides or nitrogen compounds may not be emitted to the ambient air which substantially contributes to exceeding of a air standard or cause air pollution.

Chapter NR 429: Wisconsin Malodorous and Visible Emissions Rules: Control of Malodorous Emissions and of Open Burning

This chapter establishes emission limitation, odor tests, and abatement or control requirements for malodorous air contaminant sources and to limit the conditions under which open burning is permitted in order to protect air quality. Section 429.04 addresses exceptions for open burning of explosive or dangerous materials for which there is no other safe means of disposal.

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Chapter NR 445: Wisconsin Hazardous Air Pollutants Emissions Standards

Chapter NR 445 applies to all air contaminant sources and to all owners or operators of an air contaminant source, unless it is a specifically regulated source under Chapters NR 446 through NR 449 or the NESHAPS. (NOTE: Chapters NR 446 through NR 449 and NESHAPS are not generally applicable to hazardous waste remedial activities because the activities do not usually use one of the specific source categories regulated. Chapters NR 446 through NR 449 and NESHAPS are intended for a specific type of source and not all sources of that pollutant.)

A hazardous air contaminant is defined as any air contaminant for which no ambient air quality standard is set in Chapter NR 404 of the WAC and which the department determines may cause or significantly contribute to mortality, or in a serious irreversible or incapacitating reversible illness, or may pose a significant threat to public health or the environment. Hazardous air contaminant emission concentrations are percentages of threshold limit values established by the American Conference of Governmental Industrial Hygienists. These percentages are specified in Chapter NR 445. Specific application of these standards will be determined on a site-specific basis during the FS process. Emission standards are listed for each contaminant for 24- and 1-hour averaging periods. The standards may be applicable to remedial activities that involve treatment by a process which generates hazardous air contaminant emissions. Some emission rates which may be considered at BAAP are listed in the following table.

Hazardous Air Contaminants with Acceptable Ambient Concentrations		
<i>contaminants</i>	<i>emission rate in lbs/hr w/emission points < 25 ft</i>	<i>emission rate in lbs/hr w/emission points ≥ 25 ft</i>
P-Nitroaniline	0.249600	1.032000
Nitrobenzene	0.417600	1.752000
Diethyl phthalate	0.417600	1.75200
Trichloroethylene	22.485600	94.416000
Hazardous Air Contaminants with Acceptable Ambient Concentrations (compliance to be achieved by April 1, 1993)		
Dinitrotoluene	0.124800	0.504000
Aluminum - pyro powders	0.417600	1.752000
- soluble salts	0.165600	0.672000
Chromium (metal, compounds)	0.040800	0.170400
Cobalt (metal, dust)	0.004080	0.017040

Hazardous Air Contaminants Without Acceptable Ambient Concentrations Requiring Application of Best Available Control Technology	
<i>contaminant</i>	<i>lbs/years²</i>
Acrylonitrile	25.0
Carbon Tetrachloride	25.0
N-Nitrosodi-n-propylamine (total nitrosoamines)	250.0
Nickel Compounds	250.0

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Chapters NR 500-520: Wisconsin Solid Waste Management Regulations

These regulations outline requirements for solid waste landfill construction, operation, and closure. The requirements include performance and location standards, and design, operation, and closure criteria.

A solid waste landfill may not be located within 1,000 feet of any navigable lake, pond, or flowage; 300 feet of any navigable river or stream; a floodplain; 1,000 feet of the nearest edge of any state trunk highway, interstate, or federal aid primary highway, or the boundary of any public park unless the landfill is not visible; or 1,200 feet of any public or private water supply well. The location of a solid waste landfill also must not cause significant adverse impacts to wetlands critical habitat areas, surface water, or groundwater.

Remedial actions that involve closure of a landfill that contains nonhazardous solid waste must comply with the design requirements outlined in WAC, Chapter NR 504.07. In general, all final cover systems must be designed to minimize leachate generation, reduce facility maintenance by stabilizing the final surface through design of compatible slopes and vegetation, minimize climatic effects, and provide removal of leachate and venting of gas.

When closing a facility, the owner or operator must notify the WDNR in writing at least 120 days prior to closing and restrict access within 10 days of ceasing to accept waste. Closure should be accomplished in the following manner unless a different closure plan or plan of operation has been approved:

1. The entire area previously used for disposal purposes must be covered with at least 2 feet of compacted earth sloped adequately to allow surface water runoff.
2. Surface water run-on must be diverted around all areas used for waste disposal to limit the potential for erosion and increased infiltration. Drainage swales conveying surface water runoff over previous waste disposal areas must be lined with a minimum thickness of 2 feet of clay.
3. The final slopes of the facility must be greater than 2 percent, but must not exceed 3 horizontal to 1 vertical.

4. The finished surface of the disposal area must be covered with a minimum of 6 inches of topsoil.
5. The area must be vegetated within 90 days after ceasing to accept wastes or, if waste termination is after September 15, within 90 days after March 15 of the following year.

The WDNR may require the facility to have a gas venting system if necessary. Under Section NR 508.04, WDNR may require monitoring at existing facilities, regardless of whether the facility remains in operation. Specifications for monitoring are outlined. Sampling frequency for groundwater is based on the size of the facility. Leachate head wells must be measured at least monthly for leachate level elevations. Sampling parameters must be specified in writing by the WDNR.

Chapter NR 600: Hazardous Waste Management Rules: General

This chapter provides definitions for Wisconsin's Hazardous Waste Management Rules (Chapters NR 600-699) and general permit application information. Section NR 600.04 also specifies four prohibited activities:

- underground treatment of any hazardous waste through a well;
- land treatment of any hazardous waste;
- the use of solid waste, used oil, or other material which is contaminated or mixed with a hazardous waste for dust suppression or road treatment; or
- the placement of any noncontainerized or bulk hazardous waste in a salt dome formation salt bed formation, underground mine, or cave.

This chapter also incorporates reference citations and general information concerning the hazardous waste management program.

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Chapter NR 605: Wisconsin Hazardous Waste Management Rules: Identification and Listing of Hazardous Waste Rules

These rules establish criteria for identifying the characteristics of hazardous waste and establishes a list of hazardous wastes based on these criteria. These rules are used to determine if waste handled by a solid waste generator, transporter, or owner/operator of a solid waste facilities is a hazardous waste subject to regulation.

Chapter NR 610: Wisconsin Hazardous Waste Management Rules: Small Quantity Generator Standards

This chapter specifies requirements that apply to small and very small quantity generators of hazardous waste. This rule defines very small generators as producing less than 100 kilograms of hazardous waste in a calendar month; and does not accumulate at any time quantities of hazardous waste greater than 1000 kilograms. Very small generators are exempt from full regulation if the requirements listed in NR 610.07 are met. BAAP is most likely a very small generator of hazardous waste. That waste is the result of burning of propellants in a steel burning dish, which generates a very small quantity of ash.

Chapter NR 620: Wisconsin Hazardous Waste Management Rules: Hazardous Waste Transporter Standards

The requirements which apply to the transportation of hazardous waste, as well as the licensing requirements for transporters of hazardous waste, are established in this chapter. Requirements for the implementation of a manifest system are described in NR 620.07 The rules also outlines the packaging, labeling, marking and placarding requirements in NR 620.11 which must be met for a transporter to move a transport vehicle containing hazardous waste. The rule states that packing must be conducted in accordance with 49 CFR Part 173, November 1, 1985 and labeled, marked, and placarded in accordance with 49 CFR Part 172, November 1, 1985

Chapter NR 625: Wisconsin Hazardous Waste Management Rules; Hazardous Waste Recycling Standards

This regulation provides exemptions from the requirements of NR 600.04 and Chapters NR 630 through 680 for legitimate recovery or reclamation of hazardous waste.

Chapter NR 630: Wisconsin Hazardous Waste Management Rules; Storage, Treatment and Disposal Facility General Standards

This chapter specifies the general requirements that apply to the storage, treatment, and disposal of hazardous waste. Chapter NR 630.12 describes the requirement for general waste analysis for hazardous waste. This rule requires that an owner or operator of a hazardous waste facility conduct a detailed chemical and physical analysis of a representative sample of waste before treatment or disposal of any hazardous waste. Chapter NR 630.13 describes the waste analysis plan which must be prepared and followed by the owners and operators of a hazardous waste facility. This rule further specifies locations where a hazardous waste facility may not be located, including:

- Floodplains
- Wetlands
- Endangered species habitats
- Within 200 feet from facility property line without locking (subject to WDNR ruling)
- Within 200 feet of a fault which has had displacement during the Holocene time.

The rule also establishes standards for open burning and detonation of explosives in NR 630.20. Table VII, in Section 623.20, establishes the minimum distance, from open burning or detonation of waste explosives or propellants, to the property owned by other persons.

Section NR 630.21 establishes preparedness and prevention measures required in the design, construction, maintenance, and operation of a hazardous waste facility. Requirements for a contingency plan are detailed in Section NR 630.22.

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Chapter NR 635: Wisconsin Groundwater Standards for Hazardous Waste: Groundwater and Leachate Monitoring Standards and Corrective Action Requirements.

This rule specifies groundwater and leachate monitoring requirements, as well as corrective action requirements resulting from a monitoring program. Existing landfills or impoundments are defined as facilities having accepted hazardous waste after November 19, 1980 but not after July 26, 1982. The monitoring requirement for existing landfills is contained in Section 635.17. The requirements of Section NR 635.05 and 635.16 apply to all landfills, surface impoundments, and waste piles that accepted wastes after July 26, 1982.

Solid waste disposal facilities which are approved under NR 506.15 to accept hazardous waste only from very small quantity generators are exempted from this rule.

Chapter NR 640: Wisconsin Hazardous Waste Container Standards

This rule provides environmentally acceptable hazardous waste treatment and storage operations for hazardous waste facilities that store or treat hazardous waste in containers. Small quantity generators accumulating waste on-site in containers which are in compliance with Chapter NR 610 and large quantity generators who are in compliance with Chapter NR 615. This rule may apply if hazardous wastes are held in containers on site prior to or during on-site treatment. A totally enclosed treatment facility, however, would be exempted from this rule.

Chapter NR 645: Wisconsin Hazardous Waste Tank System Standards

This rule provides environmentally acceptable hazardous waste treatment and storage operations for hazardous waste facilities that store or treat hazardous waste in tank systems. Small quantity generators accumulating waste on-site in tanks which are in compliance with Chapter NR 610 and large quantity generators who are in compliance with Chapter NR 615. This rule may apply if hazardous wastes are held in containers on site prior to or during on-site treatment. A totally enclosed treatment facility, however, would be exempted from this rule.

Chapter NR 655: Wisconsin Hazardous Waste Pile Standards

This chapter specifies the requirements which apply to hazardous waste piles. The rule states that an interim license, operating license, variance, or waiver from the department must be obtained to store or treat hazardous waste in a waste pile. Section 655.05 establishes that the design, construction and operational requirements specified in sections NR 655.07, 655.10, 660.11, 660.12, and 660.13 and the monitoring requirements in NR 635 be met. This rule may be considered during the FS process if hazardous materials are stored in a waste pile prior to or during treatment.

Chapter NR 635: Wisconsin Groundwater Standards for Hazardous Waste; Groundwater and Leachate Monitoring Standards and Corrective Action Requirements.

This rule specifies groundwater and leachate monitoring requirements, as well as corrective action requirements resulting from a monitoring program. Existing landfills or impoundments are defined as facilities having accepted hazardous waste after November 19, 1980 but not after July 26, 1982. The monitoring requirement for existing landfills is contained in Section 635.17. The requirements of Section NR 635.05 and 635.16 apply to all landfills, surface impoundments, and waste piles that accepted wastes after July 26, 1982.

Solid waste disposal facilities which are approved under NR 506.15 to accept hazardous waste only from very small quantity generators are exempted from this rule.

Chapter NR 660: Wisconsin Hazardous Waste Landfill Standards: Landfill and Surface Impoundment Standards.

This chapter applies to owners and operators of facilities that treat, store, or dispose of hazardous waste in landfills or surface impoundments. Specific location restrictions are given in Section NR 660.06. The chapter also discusses the requirements for initial site inspection and report, feasibility report, plan of operation, and minimum design requirements in Sections NR 660.07, 08, 09, 10, and 13, respectively.

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Exemptions to this rule include surface impoundments which have discharges regulated under Chapter 147, a solid waste disposal licensed under Chapters 500 to 522, and facilities operating under interim licenses.

Chapter NR 665: Wisconsin Hazardous Waste Incinerator Standards

Requirements and standards that apply to incinerators that burn hazardous waste are addressed in this chapter. This rule requires that an interim license, operating license, variance, or waiver be obtained to incinerate hazardous wastes in accordance with NR 600.9 and NR 680.

Prior to constructing a hazardous waste incinerator an initial operating license under NR 680 must be obtained. This requires an approved feasibility study and plan or operation report. The requirements for these reports are provided in NR 665.06. Operation requirements for incinerators include:

- operation of the incinerator should minimize interference with other activities.
- A sign must be posted to show the name, license number, and hour of operation.
- All hazardous waste must be confined to a designated storage area.
- Hazardous waste may only be stored in tanks or containers in accordance with NR 640 and NR 645.
- The incinerator must be brought to steady state, normal conditions, including steady state temperature and air flow, using auxiliary fuel or other means, before adding hazardous waste.
- Records must be maintained for a minimum of 3 years, including records of weights of materials incinerated, the quantity of resulting residue, and hours of plant operation.
- Records must detail all training required and completed.
- Adequate cleaning equipment must be available.

- Charging openings and other equipment must be provided with adequate safety equipment.
- WDNR must be allowed to inspect new incinerators after completion and at least 10 days prior to operation.
- Monitoring and inspections must be conducted in accordance with section NR 665.09(11)(a-g).
- An automatic cut off device must be operational which will cut off waste feed when a deviation from or exceedance of the limits.
- Required removal efficiencies for a variety of wastes is provided in section NR 665.09(13).
- Operations must conform to the requirements specified in the license.
- The department will specify acceptable operating limits based on the results of the analysis and trial burns.
- Hazardous waste may not be fed into the incinerator during start-up or shut-down unless the incinerator is operating within the conditions of operation.
- Fugitive emissions must be controlled by either: (1) keeping the combustion zone sealed; (2) maintaining a combustion zone pressure of lower the atmosphere; or (3) an alternate means equivalent to (2).
- The incinerator must cease operations if waste feed, incinerator design, or operating conditions exceed limits designated in license.
- The incinerator must be designed to meet the requirements in NR 640.06.

The rule further states that throughout the operating period, unless the owner or operator can demonstrate that the residue removed from the incinerator is not a hazardous waste, the owner or operator becomes a generator of hazardous waste.

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Chapter NR 670: Miscellaneous Hazardous Waste Standards: Miscellaneous Unit Standards

This chapter specifies requirements that apply to facilities that are not specified otherwise. Prior to establishing or constructing a miscellaneous unit, an operating license must first be issued following approval of a feasibility study and plan or operation report.

Standards for miscellaneous units are based on protection of human health and the environment that may be due to migration of waste constituents: in the groundwater or subsurface environment; in surface water, wetlands, or on the soil surface; and in the air. Parameters which must be considered are described in section NR 670.08.

Requirements for thermal treatment facilities other than incinerators is addressed in section NR 670.11.

Chapter NR 675: Wisconsin Hazardous Waste Land Disposal Restrictions

This chapter identifies hazardous wastes that are restricted from land disposal and defines those limited circumstances under which an otherwise prohibited waste may continue to be disposed of on land. An exemption from this rule may be obtained if certain conditions are met. This exemption would allow wastes which are otherwise prohibited from land disposal to be treated in a surface impoundment. Evaporation of hazardous constituents as the principal means of treatment is not included in this exemption. Treatment standards are expressed as concentrations of waste extract for contaminants of concern.

Chapter NR 680: Hazardous Waste Facility Licensing Regulations

Minimum standards for reports, plan submittals, and the issuance of licenses and variances for facilities which recycle, treat, store, or dispose of hazardous waste are established in this chapter. The fee schedule for facilities other than landfills and surface impoundments is provided in Table XII of the rule. The fee schedule for landfill and surface impoundments is provided in Table XIII.

Chapter NR 685: Hazardous Waste Facility Closure Regulations

This chapter establishes requirements for closure, long-term care, and financial responsibility of hazardous waste facilities.

Closure performance standards require that a hazardous waste facility must be closed in a manner that: minimizes further maintenance; manages post closure escape of wastes, hazardous leachate, contaminated runoff or waste decomposition products to ground or surface waters or the atmosphere; and meets other closure requirements established with the Wisconsin Hazardous Waste Management Rules.

The rule further establishes that the owner must provide long-term care for the closed hazardous waste facility for 30 years after closure.

Wisconsin Statutes Annotated, Chapter 30, Dredge and Fill Requirements

This statute outlines permit requirements for structures and deposits in Wisconsin navigable waters and for enlargement of waterways. These requirements will be considered and complied with when developing and implementing remedial actions at BAAP that involve navigable waters. Under Section 30.12, it is unlawful to deposit any material or to place any structure on the bed of any navigable water without a permit where no bulkhead line has been established or beyond a lawfully established bulkhead line. A structure must not materially obstruct navigation or reduce the effective flood flow capacity of a stream, and must not be detrimental to the public interest.

Under Section 30.19, unless a permit has been granted, it is unlawful to construct, dredge, or enlarge any artificial or natural waterway, canal, channel, ditch, lagoon, pond, lake, or similar waterway where the purpose is ultimate connection with an existing navigable stream, lake, or other navigable waters, or where any part of the artificial waterway is located within 500 feet of the ordinary high-water mark of an existing navigable stream, lake, or other navigable waters. A permit is also required for grading or removing topsoil from the bank of any navigable stream, lake, or other body of navigable water where the area is exposed by the grading and where removal will exceed 10,000 square feet. Exceptions are granted for public highways, agricultural uses, lakes and streams located in certain counties with a population of 750,000 or more, and any work required to maintain the dimensions of an enlarged waterway.

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Chapter 30 also addresses bridge construction and maintenance, waterfowl habitat management, cutting weeds in navigable waters, wharves, piers, swimming rafts, diversions of water from lakes and streams, and removal of material from beds of navigable waters.

If the response action is conducted entirely on-site, a permit would not be required.

City of Baraboo Floodplain Zoning Code (Subchapter II)

The Baraboo Floodplain Zoning Code divides floodplain areas into three districts: the Floodway District, the Flood Fringe District, and the General Floodplain District. The Floodway District is the channel of a stream and those portions of the floodplain adjoining the channel that are required to carry and discharge the floodwater or flood flows of any river or stream associated with the regional flood. The Flood Fringe District is the area between the regional flood limits and the floodway area. The General Floodplain District is the land that has been or may be hereafter covered by floodwater during the regional flood and encompasses both the Floodway and Flood Fringe districts.

Certain activities are prohibited or subject to specific restrictions in floodplain areas. Within the Floodway District, only open space having low flood damage potential and not obstructing flood flows is permitted, including agricultural uses, nonstructural industrial or commercial uses (e.g., parking lots), public and private recreational uses, extraction of sand or gravel, marina- and boat-related structures, railroads, pipes, streets, and culverts. Specific standards for developments in floodway areas are listed.

In the Flood Fringe District, any structures, land use, or development may be permitted, provided a land use permit has been issued by the Building Inspector. Manufacturing and industrial buildings, structures, and accessory uses must be elevated or flood-proofed to 2 feet above the regional flood elevation. The storage or processing of materials that are buoyant, flammable, or explosive, or which in times of flooding could be injurious to human, animal, or plant life, must be at or above the flood protection elevation or flood-proofed. All solid waste disposal sites, whether public or private, are prohibited in flood fringe areas.

A building permit must be obtained for construction in a floodplain. Flood-proofing measures must be designed consistent with the flood protection elevation for the particular area associated with it. The applicant must submit a plan or document

certified by a registered professional engineer or architect that the flood-proofing measures are adequately designed for protection to the flood protection elevation for the particular area. All flood-proofing must provide anchorage to resist flotation and lateral movement.

All zoning and permit requirements associated with activities within a floodplain will be considered if remedial or construction activities at BAAP involve work in a floodplain.

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ACLs	Alternate Concentration Limits
AIC	Acceptable Intake - Chronic
AIS	Acceptable Intake - Subchronic
ARARs	Applicable or Relevant and Appropriate Requirements
AWQC	Ambient Water Quality Criteria
BAAP	Badger Army Ammunition Plant
BACT	Best Available Control Technology
BOD	biochemical oxygen demand
CAA	Clean Air Act
CAAAs	Clean Air Act Amendments
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CSD	Treatment standards for hazardous soil and debris
CSFs	Cancer Slope Factors
CWA	Clean Water Act
DOT	Department of Transportation
EO	Executive Order
ESA	Endangered Species Act
FS	Feasibility Study
FWQS	Surface Water Quality Standard
HA	Health Advisories
HAPs	Hazardous Air Pollutants
HEAs	Health Effects Assessment
HHAG	Human Health Assessment Group
HSWA	Hazardous and Solid Waste Amendment
LDRs	Land Disposal Regulations
MACT	Maximum Achievable Control Technology
MCL	Maximum Contaminant Level
MCLGs	Maximum Contaminant Level Goals
mg/L	milligrams per liter

GLOSSARY OF ACRONYMS

NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NCP	National Contingency Plan
NPDES	National Pollutant Discharge Elimination System
NSPS	New Source Performance Standards
OSHA	Occupational Health and Safety Act
PAL	preventative action limits
POTW	publicly owned treatment works
PSD	Prevention of Significant Deterioration
RfC	Reference Concentration
RfD	Reference Dose
RCRA	Resource Conservation and Recovery Act
SDWA	Safe Drinking Water Act
SIPs	State Implementation Plans
SMCLs	National Secondary Drinking Water Standards
SPCC	Spill Prevention, Control, and Countermeasure
TCLP	Toxicity Characteristic Leaching Procedure
TDS	total dissolved solids
tpy	tons/year
TSDF	transfer storage and disposal facility
TSP	total suspended particulate matter
TSS	total suspended solids
$\mu\text{g}/\text{m}^3$	micrograms per cubic meter
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
UST	Underground Storage Tanks
VOCs	volatile organic compounds
WAC	Wisconsin Administrative Code

WDNR
WPDES

Wisconsin Department Natural Resources
Wisconsin Pollutant Discharge Elimination System

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SOIL VAPOR SURVEY

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APPENDIX B: SOIL VAPOR SURVEY

B.1 STANDARD OPERATING PROCEDURES

This section contains the standard operating procedures followed by Northeast Research Institute Inc. (NERI) of Farmington, Connecticut, while performing the Petrex soil vapor survey at BAAP during the RI.

B.1.1 Sample Production and Preparation

Charcoal Sieving. The static volatile organic compound (VOC) collector is prepared by applying presieved activated charcoal to the end of a ferromagnetic wire.

Charcoal Bonding. The procedure for preparing the activated charcoal is proprietary information. The procedure results in the production of a collector consisting of size-sorted activated charcoal bonded to the area within 1 cm of the end of a ferromagnetic wire with a Curie point of 358°C.

Collector Containers. Culture tubes, measuring 25 mm by 125 mm and having a screw cap closure, are washed in a biodegradable detergent, rinsed in methanol, and baked at 180°C for 1 hour.

Wire Cleaning. The previously constructed wires are cleaned by heating in a special apparatus at 358°C a total of 35 times. The wires are cleaned in lots of 32 wires. From each lot, two wires are removed for immediate analysis to verify the cleanliness of the lot. The remaining 30 wires are then sealed in one clean culture tube under an inert atmosphere and placed in inventory.

Packaging for Client. Immediately prior to shipping the wires to the field, the tubes containing 30 wires are removed from inventory and the wires are repackaged under an inert atmosphere in individual tubes. Ten percent of the repackaged tubes contain two wires and are called "duplicates." The collectors are packaged by double bagging in Ziploc bags in an inert atmosphere. These bags are then placed in inventory in a temperature-controlled room.

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Quality Control and Quality Assurance. Prior to releasing stocked wires for a field survey, two single wires from each lot are checked for cleanliness and collecting potential. This QA/QC phase measures and documents collector preparedness when leaving the laboratory. One of these wires is analyzed without exposure in order to demonstrate that the lot is clean, and the other wire is exposed to hexane vapor for 2 seconds and then analyzed in order to verify that the charcoal is highly adsorptive. The duplicates are used when the wires return from the field. These wires help determine the required machine sensitivity and act as a measure of reproducibility.

Custody Document. A "custody document" accompanies each group of collectors leaving the laboratory and remains with the group until the collectors have been exposed, analyzed, and are disposed of.

B.1.2 Field Operations

Locating Sample Sites. Sample placement sites, usually predetermined on an accepted survey proposal, are located from a nearby, surveyable landmark using a compass and pacing or some other measuring device (e.g., pacing wheel, hip chain, or tape measure). A transit may be used for more accurate placement, but such accuracy is seldom required.

Soil Coring. Once a sample site has been established, a hole is cored to a depth of 1 to 3 feet, depending on the soil nature (sample placement depth is held constant for a given survey). This is accomplished using a variety of tools depending on the nature of the material to be cored. The holes should be vertical and as free from debris as possible. When the sampling is performed in areas covered by asphalt or concrete, a generator-powered rotary hammer drill with a carbide-tipped bit is used to drill a 1½-inch-diameter hole in the cover. A hand auger is used to remove the cuttings and road base from the hole, and then to extend and deepen the hole for collector placement.

Collector Placement. Immediately after the hole is cored, a collector tube is removed from the Ziploc bag and the bag is resealed. The cap is then removed from the tube, and the tube is placed vertically, open end down, into the hole. The hole is then backfilled with the soil core which was removed. The cap is placed in a clean Ziploc bag and stored until collector retrieval. Collectors placed under asphalt or concrete are treated the same as those in uncovered soil, except for modifications to permit easy retrieval and to avoid potential downhole contamination from surface cuttings. To allow retrieval of these collectors, a piece of galvanized wire is twisted

around the neck of the tube and run to the surface so that the sample may be recovered by pulling the wire. Once the collector is placed in the hole, sterile sand is used to backfill the hole to a point well over the top of the sample. An aluminum plug is then placed near the top of the hole, and the remainder of the hole is filled with the sterile sand.

Site Identification. Each site is flagged using pin flags or ribbon flagging, and the site location is marked and numbered on a base map. A field notebook is used to record the date, collector number, site location description, soil type, and general observations.

Exposure Time. Time calibration collectors are included as part of every survey. These are QA collectors used to monitor sample loading during the survey. These collectors are placed in an area of known or suspected contamination, and sets are retrieved and analyzed at intervals to indicate the appropriate residence time for survey samples. Separate "travel blank" collectors are also included as a QC measure in every survey. These collectors are buried along with the survey collectors, but the tubes are never opened. These control collectors monitor for contamination during transport or placement.

Collector Retrieval. The collectors are retrieved when the time calibration collectors reveal that there has been sufficient loading of gases on the charcoal absorbent. In the field, the soil is removed until the tube is exposed. A cap is taken from the sealed Ziploc bag. The Teflon seal is checked to make sure it is seated inside the cap. The culture tube is removed from the hole and any dirt that is on the threads of the tube is wiped off with a clean cloth. In the event the tube is broken or cracked, the collector wire is transferred to a new tube using forceps. The tube is capped and sealed. All flagging material is retrieved.

Collector Numbering. Each tube is immediately numbered according to the scheme established in the field notes and on the base map. The collector number is written on adhesive labels which are applied to the tube cap. No two sites may have the same number.

Collector Shipment. Once the collectors have been retrieved, they are sealed in double Ziploc bags, wrapped, and then padded with bubble packing. Material such as Styrofoam peanuts or newsprint can introduce possible contaminants to the collectors and should not be used for packaging. The collectors, field notes, base map, and chain-of-custody document are either hand-carried back to NERI's

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analytical laboratories in Lakewood, Colorado, or are shipped by overnight carrier service.

B.1.3 Collector Analysis

Numbering Check. Upon receipt of the collectors, the number on each tube is recorded and any missing or duplicated numbers are noted. A missing number generally indicates that the collector could not be retrieved. Samples with identical numbers generally cannot be used unless their true site location can be established.

Instrumentation. Thermal desorption is accomplished using a Fisher radio frequency power supply and a Curie point pyrolyzer designed by NERI and Extrel. The mass spectrometer used is an Extrel SpectrEL quadrupole mass spectrometer. A few Petrex wire samples contained several compounds. NERI desorbed some of the duplicate backup wires by another technique using pyrolysis/GC/MS. This technique enabled detection of many more compounds at very low detection limits. Using this method on a number of wires, the presence of carbon tetrachloride was confirmed. In addition, several other compounds were identified as present in certain areas, including dichlorobenzene, hexachloroethane, nitrobenzene, nitrotoluene, dinitrotoluenes, dinitrophenol, dinitrobenzene, trinitrotoluene, and hexachlorobenzene. The analysis is controlled and recorded by DEC PDP 11/23 microcomputer. Following the analysis, all data are collected and archived on a PDP 11/73 microcomputer. Data for all active jobs are stored on both of the PDP 11 computers, as well as on magnetic tape. Data for all completed jobs are stored on magnetic tape in perpetuity.

Calibration. Mass assignment, sensitivity, and resolution are manually adjusted using a Perfluorotributylamine (PFTBA) standard. Following tuning, the spectrum of PFTBA is collected under computer control and the digital spectrum is compared to the known spectrum of PFTBA with respect to sensitivity, response linearity, and mass assignment. If more than three of the measured peaks deviate from the published values by greater than 0.1 amu, or if any single peak deviates by greater than 0.2 amu, the instrument is tuned again.

Instrument Parameters. The instrument is operated with the following parameters.

Vacuum	$< 3 \times 10^{-6}$ torr
Ionization Energy	70.0 eV
Ionization Current	12.0 mA
Desorption Time	5.0 sec
Desorption Temperature	358°C
Number of Scans/Sample	30
Scan Rate	1,250 amu/sec

Mass Spectrometer Analysis and QA/QC. Each collector wire is analyzed in random order. The entire group of survey collectors are analyzed as one run without interruption from other surveys.

The organic gases adsorbed on the carbon are thermally desorbed from the carbon, separated according to ion mass, counted, and a mass spectrum of masses from 15 to 240 is obtained.

Periodic (approximately every 20 samples) machine background analyses are performed as a QC measure to assure minimal influence from internal communication. If there are peaks that are not related to atmospheric gases, the supervisor is notified and the mass spectrometer is shut down and cleaned as necessary.

A written sample number record is kept during the analysis to prevent accidental cross-numbering. The mass spectrometer control program prompts the operator with a warning if a sample number is entered that has already been used. The operator then checks the current number, along with the disk storage location of the previously entered number, to identify the true numbering situation.

Data Filing. The raw data file generated by the sample analysis is labeled for storage under a unique file name.

Detection Limits. The sensitivity of the Petrex method can be estimated by making the assumption that there is free soil gas to be sampled continuously in the vadose zone. We have determined by the spiking of Petrex wires that we have the following mass spectrometric system detection limits.

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TYPICAL CHLORINATED SOLVENTS	PETREX WIRE	APPROXIMATE FIELD (25 DAYS)
Tetrachloroethylene	10 ng	15 ppt
Trichloroethylene	10 ng	15 ppt
trans-1,2-Dichlorethylene	50 ng	60 ppt
Dichloromethane	25 ng	60 ppt
Trichloromethane	10 ng	30 ppt
Tetrachloromethane	20 ng	30 ppt
Vinyl Chloride	50 ng	200 ppt

ng = nanograms; ppt = parts per trillion

Because we put the entire wire into the mass spectrometer, 99 percent of the passively adsorbed compounds end up in the quadrupole for detection. If we assume a sampling rate of the Petrex collector to be approximately 10 cubic centimeters per minute, we can calculate the approximate field (25 days) sensitivity.

The working range of the methodology relates somewhat to the performance of the mass spectrometer and the linear range of the detector system. When dealing with individual ions, we have a 10^5 ion count working range and a saturation value of approximately 2.4×10^5 . We can correct target ions for saturation in clusters by using adjacent ratios to extend the target ion above the 2.4×10^5 saturation range. Generally, uncertainties in these mass spectrometric measurement and detection issues are not a major contributor to the mapping of ion flux or our interpretation of compound anomalies. The typical flux or ion count range for soil gas concentration is 10 to 5,000 ng on wire adsorption or 10 ppt to 2.4 parts per billion (ppb) for an average 25-day survey.

If you review our calibration procedure, you will see that much emphasis is put on FC43 tuning ratios. We assure reference tuning ratios which are equivalent to what is recommended for USEPA work. Representative duplicate wires are used to establish an initial working range for a set of target compounds. Then, those conditions are held constant throughout the run.

B.1.4 Data Interpretation and Presentation

Map Generation. The sample location maps are created by placing the field base map on a digitizing board and entering each site as an X-Y coordinate relative to some surveyable feature at the site. The relative ion counts for each compound can then be plotted at the sample locations. Cultural and topographic features can also be digitized onto the map as reference points.

Compound Identification. The mass spectrum that is drawn for each sample is compared to a library of mass spectra derived from known VOCs. Several thousand pure compound spectra have been developed by the Bureau of Standards and are available for spectra comparison. NERI has also developed its own library of spectra through headspace analysis of pure compounds using the Petrex wires. Once a compound has been identified in this manner, the ion current or "flux" for this compound is defined as the total ion current for the "parent peak" of that compound.

Relative Flux Determination. The process of determining ion currents (relative intensities) of indicator peaks is computerized. All ion current data are extracted from the original data file and are processed for identification.

The relative ion current intensity (relative intensities) of the gases that are desorbed from the collectors are matched with sample locations on a map of the survey area. These relative intensities are useful for inferring the areal extent of contamination and relative differences in the concentrations of the compounds in the soil or groundwater. This can aid in determining the direction of source areas or direction of movement of contamination.

These surface collections and analyses cannot be used to determine the depth to the source contaminants or the precise concentration at depth. Because compounds can be differentiated by their spectra, analyses from the carbon collectors can be used to help differentiate multiple compounds and multiple source areas within a single survey.

Data Interpretation. Once the relative intensities for the compound in question are mapped, the data can be contoured to reveal those areas with "hot spots" and the orientation of plume migration. All other available data, such as geologic setting, soil types, groundwater conditions, type of contaminant, site history, and other factors are taken into account as the interpreter draws conclusions. One conclusion may be

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that not enough data are available, and a follow-up survey may be recommended to further clarify the interpretation.

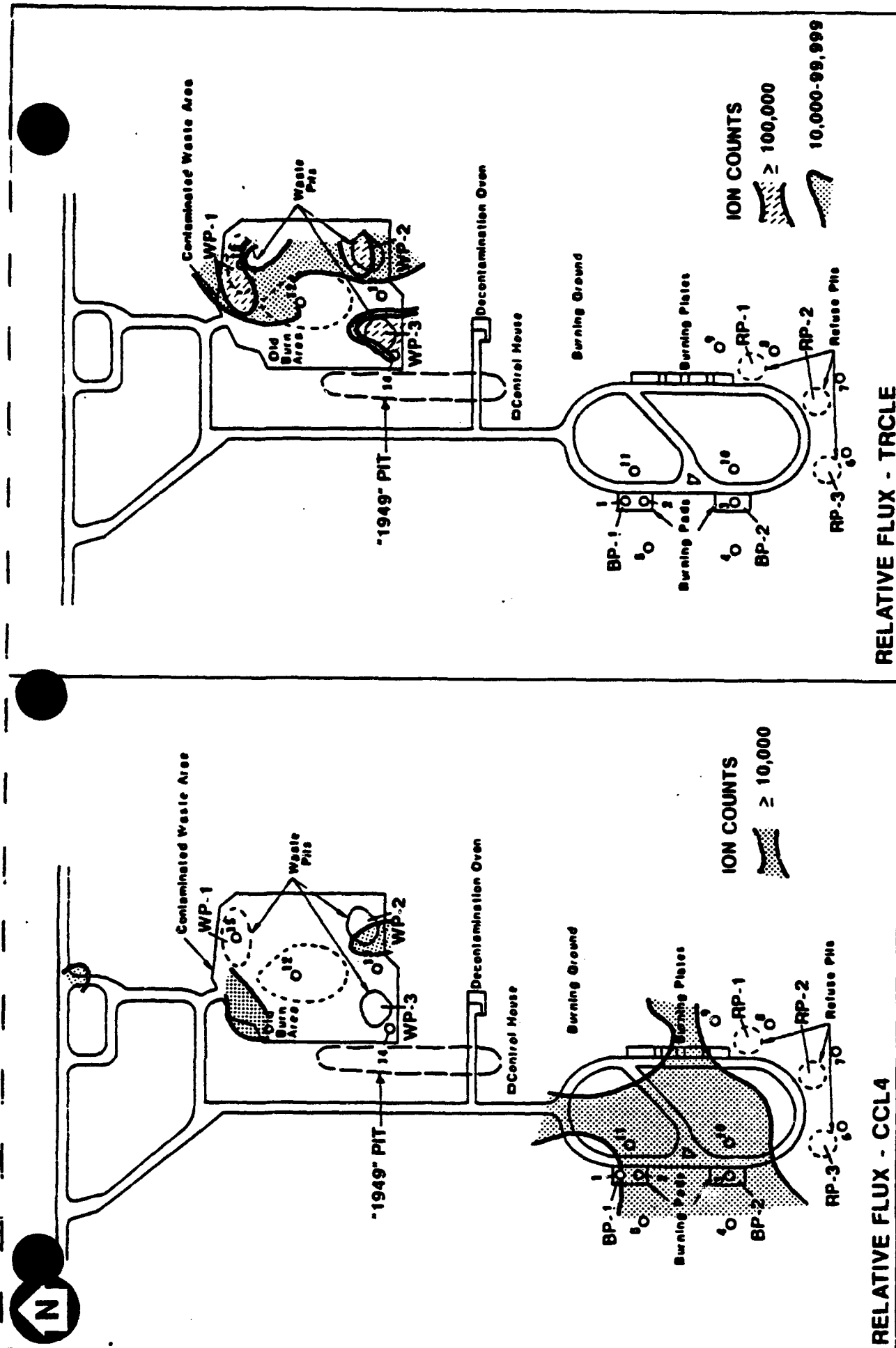
Data Presentation. Once the data has been compiled, interpreted, and mapped, a report describing the Petrex technology, the survey design and results, interpretations, conclusions, and recommendations is produced for the client's use. Also, the maps are printed which display compounds of the client's specifications. These reports and maps are for the client's use only, and no report or map is released to anyone else without prior written consent of the client. This confidentiality policy is never breached.

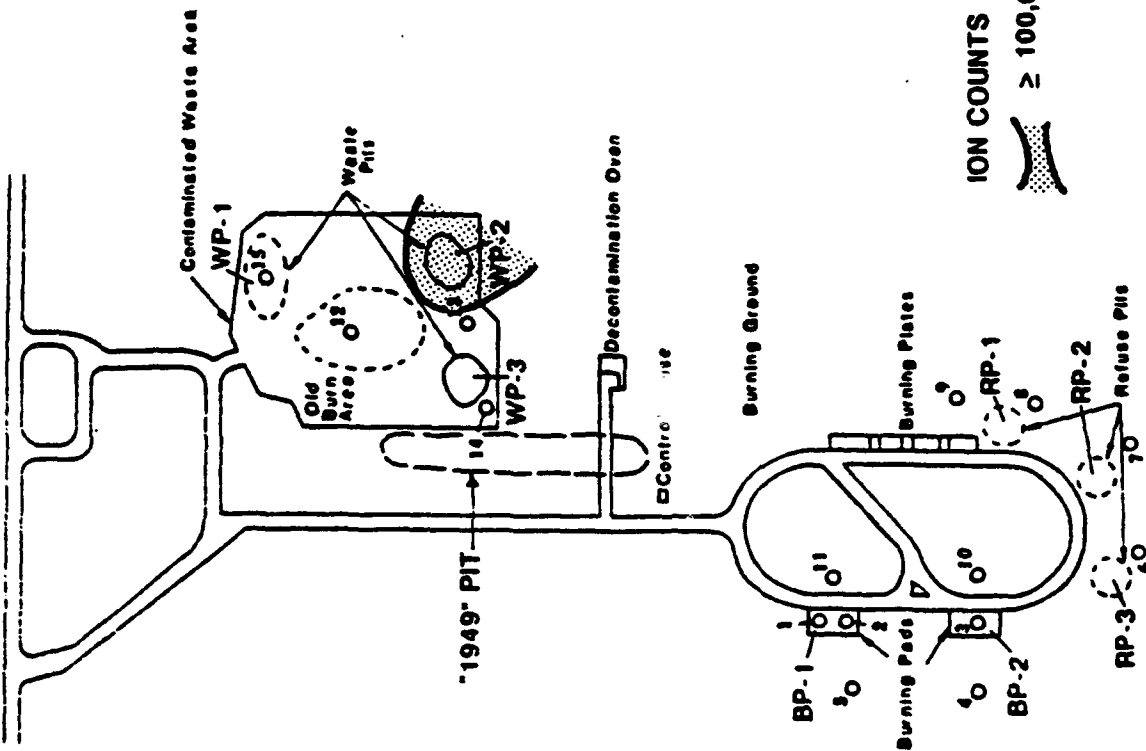
B.1.5 Interpretation of Petrex Maps

As previously stated, the relative intensities for any compound at one sample location can only be compared to another location within the same survey for the same compound. Relative intensities of different compounds cannot be compared to each other. Also, the relative intensities of one survey cannot be compared to the relative intensities of any other survey, even between two surveys at different times of the year over the same site. Since the data are non-quantitative, only the flux patterns of a survey or the relative difference between flux values of two samples from the same survey should be considered during interpretation. However, the same "hot spots" and plumes should contour in the same place over multiple surveys at a given site, allowing for migration.

B.2 RESULTS

The results of the soil vapor survey are presented in the following figures. Figures B-1 through B-4 illustrate areas of elevated relative flux concentrations for various hydrocarbons and chlorinated hydrocarbons in the Propellant and Deterrent Burning Grounds. Figures B-5 through B-12 present the relative ion counts at each sample location for the specific compound being evaluated. The ion counts were generated through analyses of mass spectra data generated for each sample.



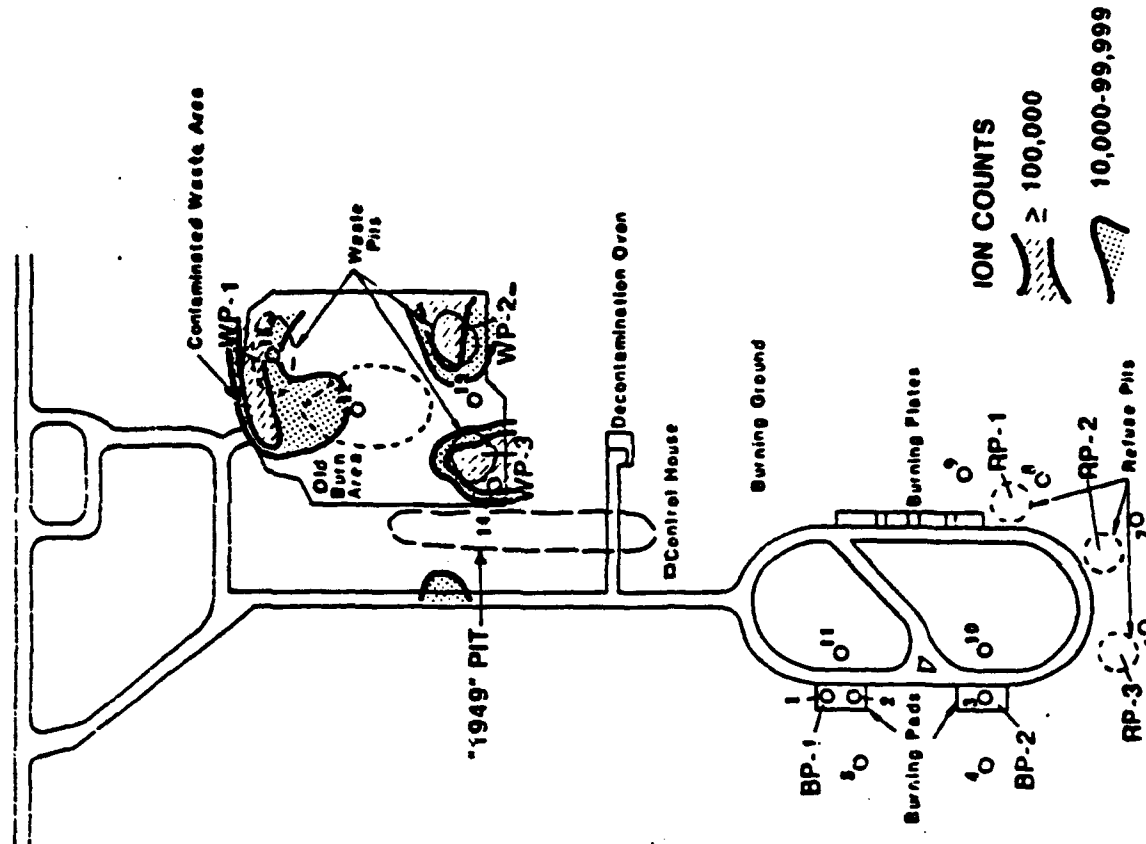


RELATIVE FLUX - TCLEE

SCALE IN FEET

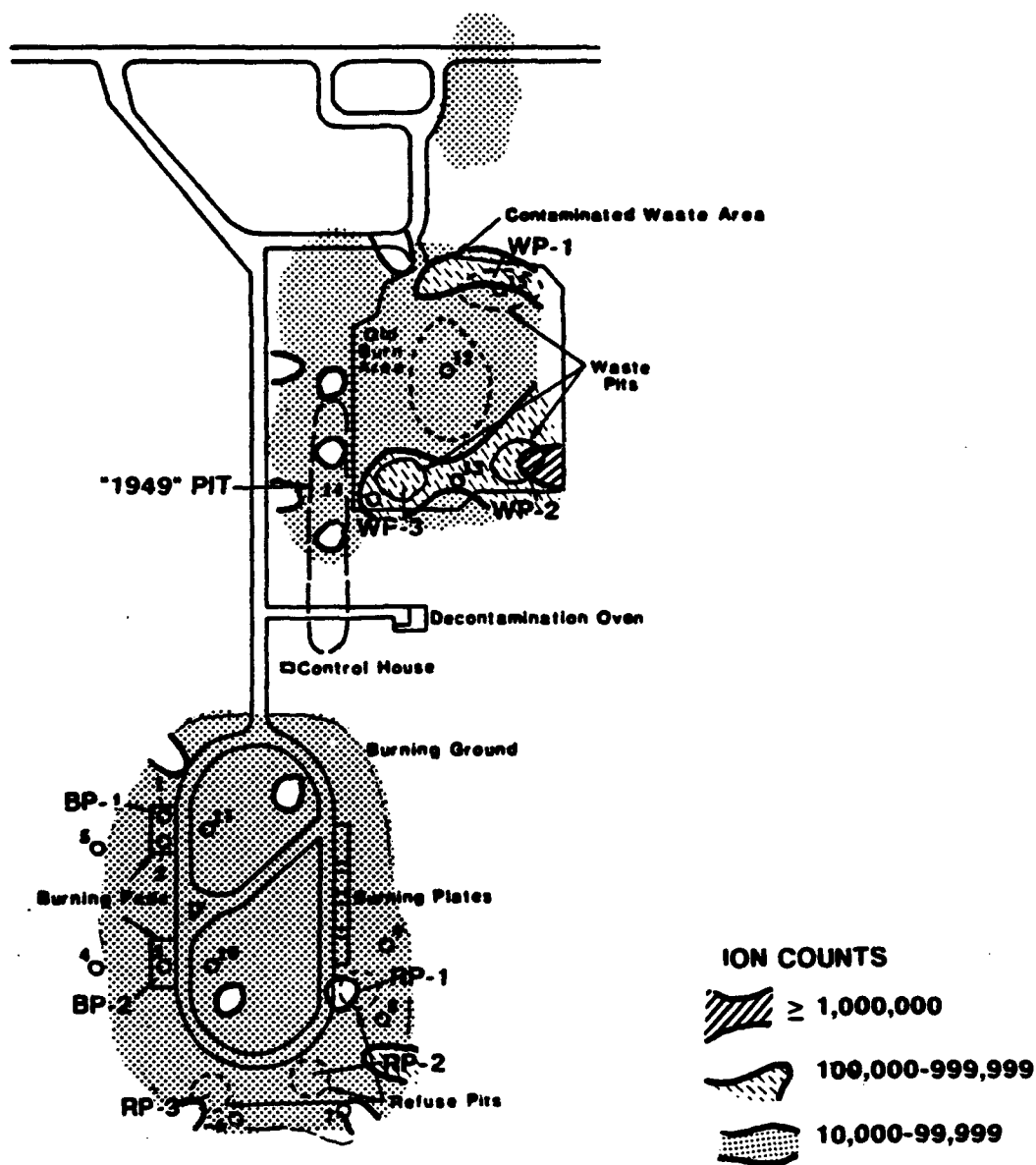


NOT TO BE USED FOR
EXPLANATION OF OTHER SYMBOLS.



RELATIVE FLUX - SIMPLE AROMATICS

FIGURE B-2
SOIL VAPOR SURVEY RESULTS
FOR TCLEE AND SIMPLE AROMATICS
PROPELLANT BURNING GROUNDS
BADGER ARMY AMMUNITION PLANT



RELATIVE FLUX - COMBINED HYDROCARBONS

NOTE: SEE FIGURE 2-4 FOR
EXPLANATION OF OTHER SYMBOLS.

SCALE IN FEET

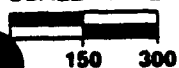
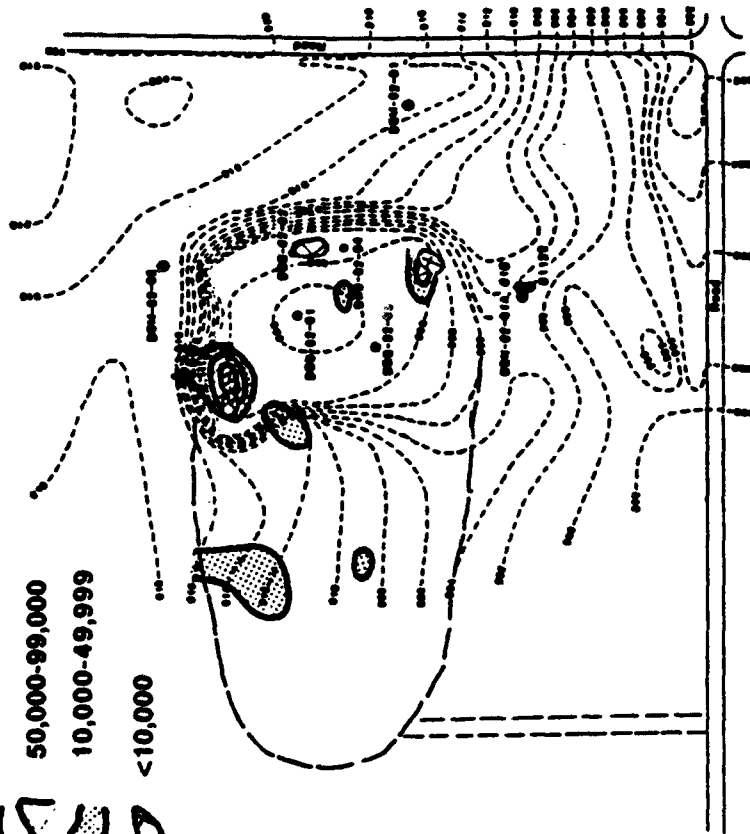
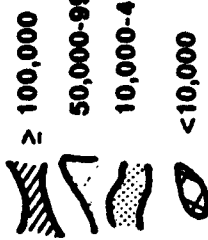


FIGURE B-3
SOIL VAPOR SURVEY RESULTS
FOR COMBINED HYDROCARBONS
PROPELLANT BURNING GROUND
BADGER ARMY AMMUNITION PLANT

ECJORDANCO



ION COUNTS

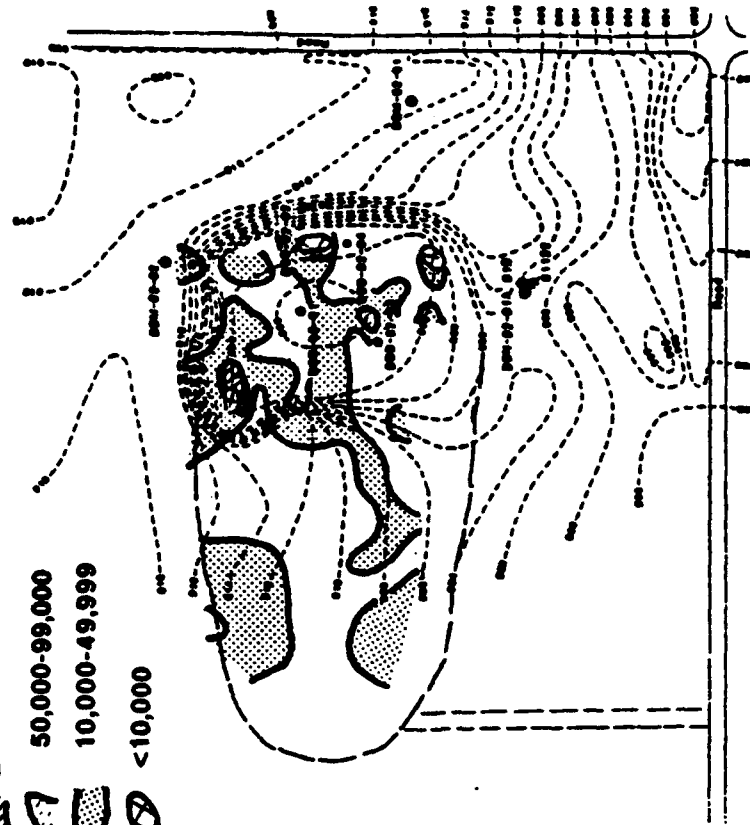
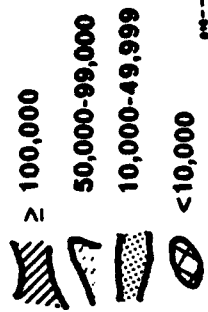


RELATIVE FLUX - SIMPLE AROMATICS



SEE FIGURE 2-5 FOR
EXPLANATION OF OTHER SYMBOLS.

ION COUNTS

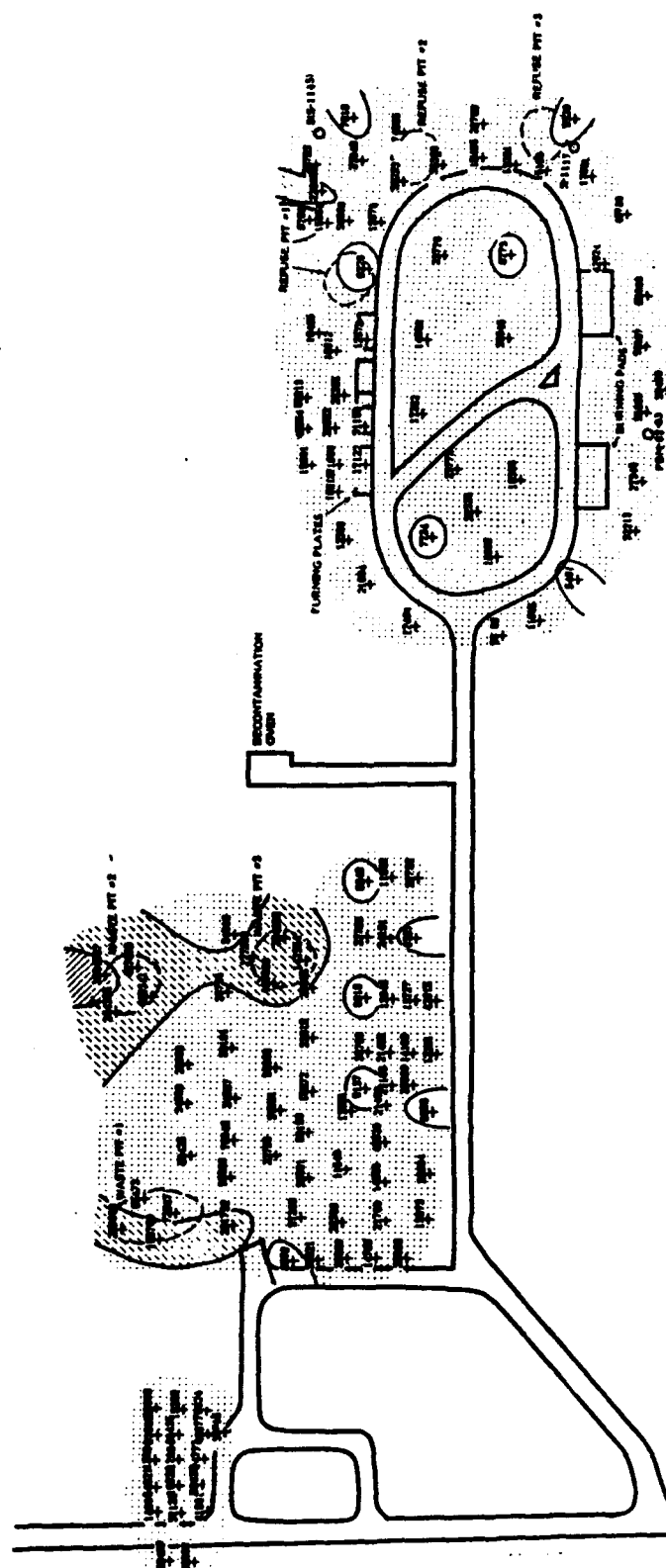


RELATIVE FLUX - ALKANES

FIGURE B-4
 SOIL VAPOR SURVEY RESULTS FOR
 SIMPLE AROMATICS AND ALKANES
 DETERRENT BURNING GROUND
 BADGER ARMY AMMUNITION PLANT



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SCALE IN FEET
0 100 200

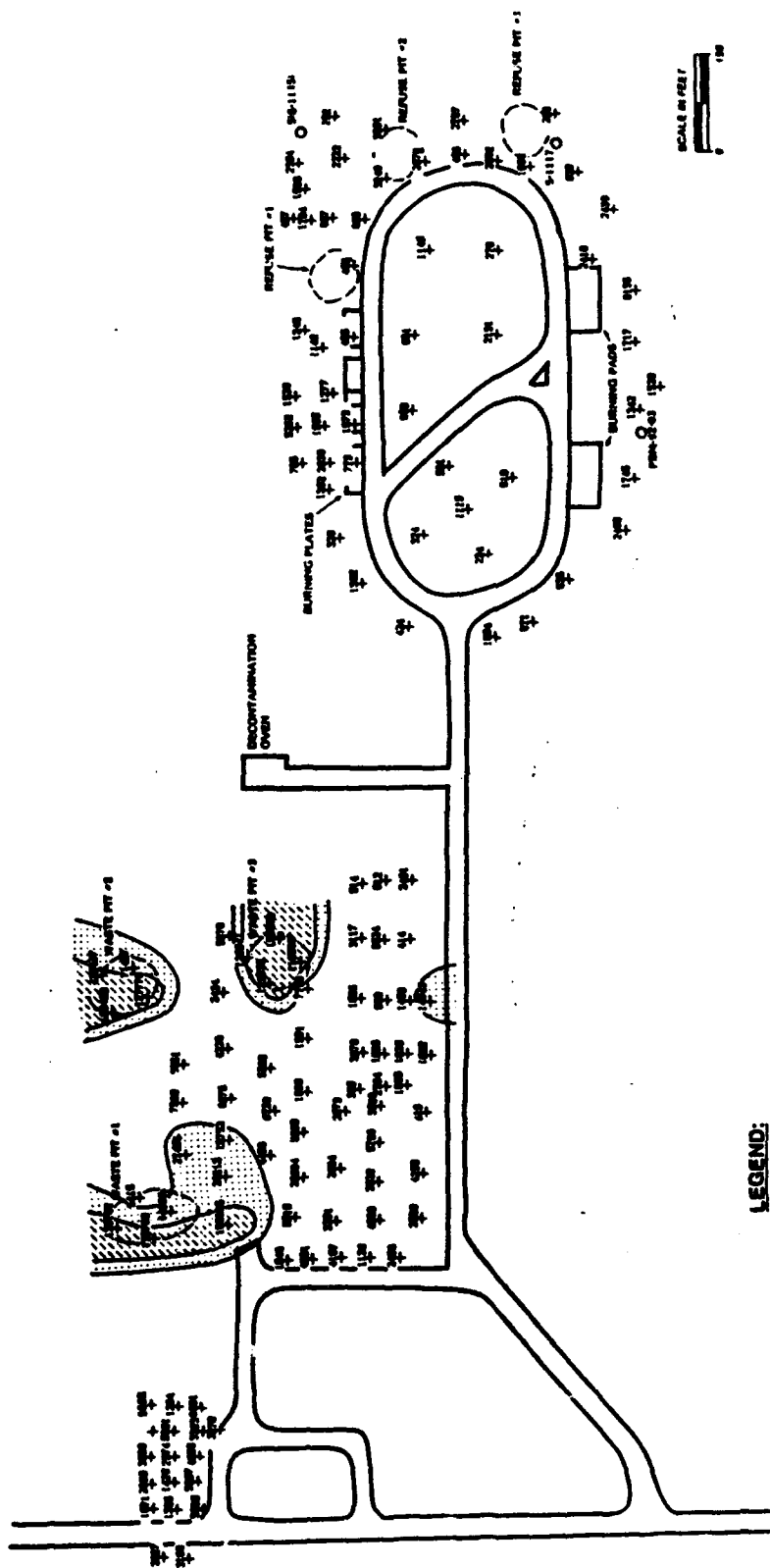
LEGEND:
ION COUNTS
≥ 1,000,000
100,000 - 999,999
10,000 - 99,999

FIGURE B-5
RELATIVE FLUX COMBINED HYDROCARBONS
PROPELLANT BURNING GROUND
BADGER ARMY AMMUNITION PLANT
EC JORDANCO

NOTE: SUBMITTED TO E.C. JORDAN ON MARCH 23, 1989 BY NERI OF LAKEWOOD, COLORADO.



PETREX
A DIVISION OF HERTSMAN & HERTSMAN

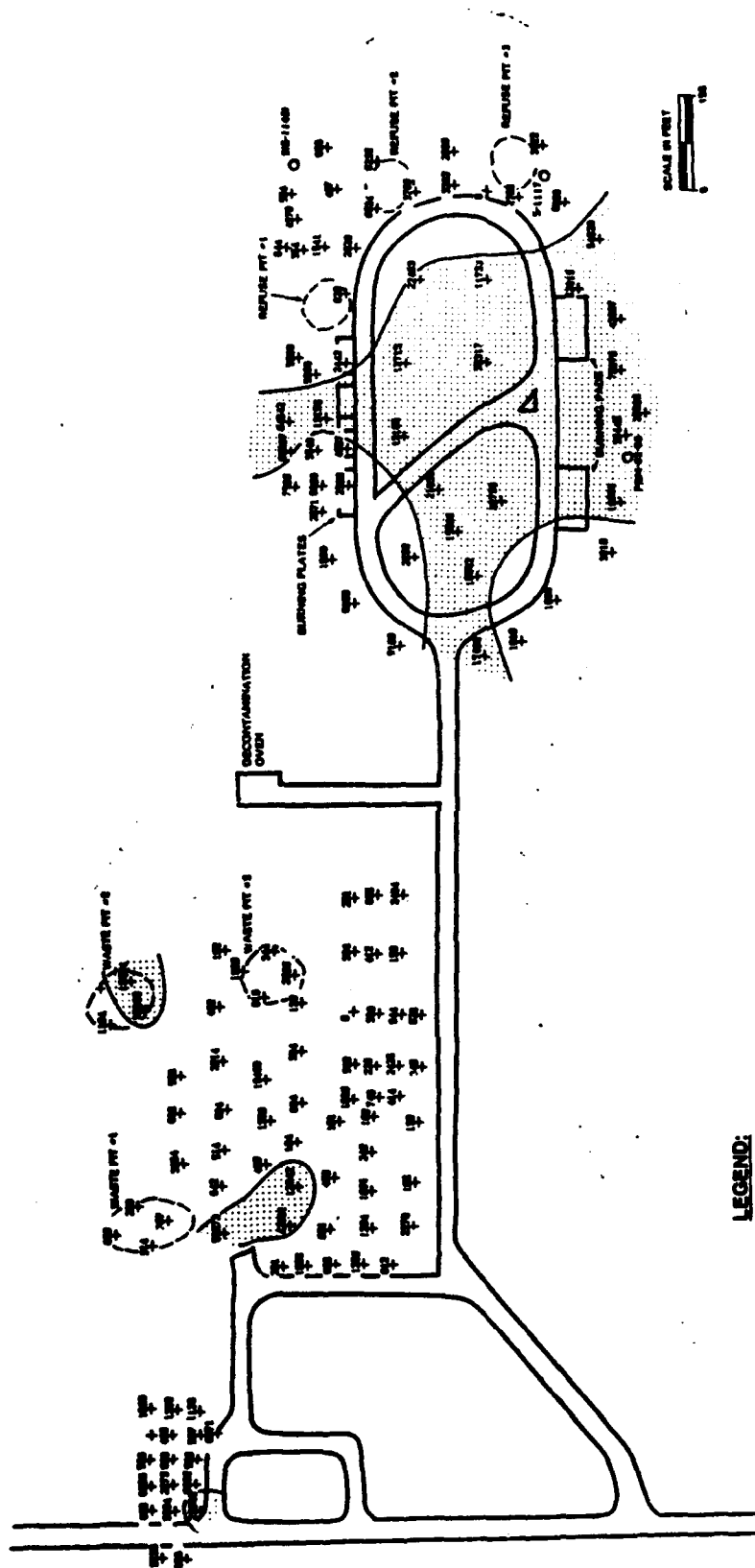


NOTE: SUBMITTED TO E.C. JORDAN ON MARCH 23, 1988 BY NEM OF LAKEWOOD, COLORADO.

FIGURE B-6
RELATIVE FLUX SIMPLE AROMATICS
PROPELLANT BURNING GROUND
BADGER ARMY AMMUNITION PLANT
ECJORDANCO

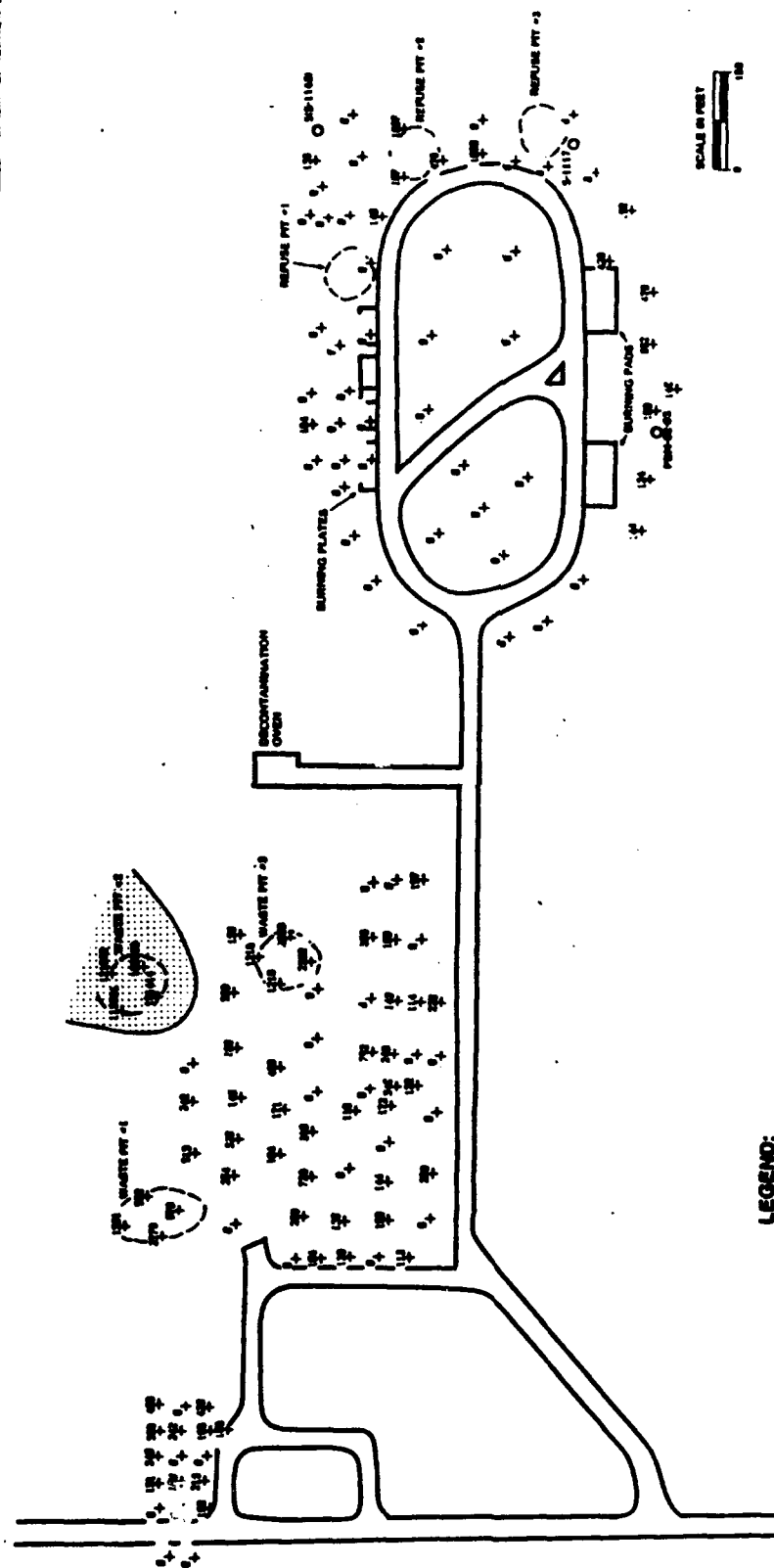


PETREX
A DIVISION OF PETROLEUM GULF OF AMERICA INCORPORATED



NOTE: SUBMITTED TO E.C. JORDAN ON MARCH 23, 1989 BY NEW OF LAKEWOOD, COLORADO.

FIGURE B-7
RELATIVE FLUX CARBON TETRACHLORIDE
PROPELLANT BURNING GROUND
BADGER ARMY AMMUNITION PLANT
EC JORDANCO



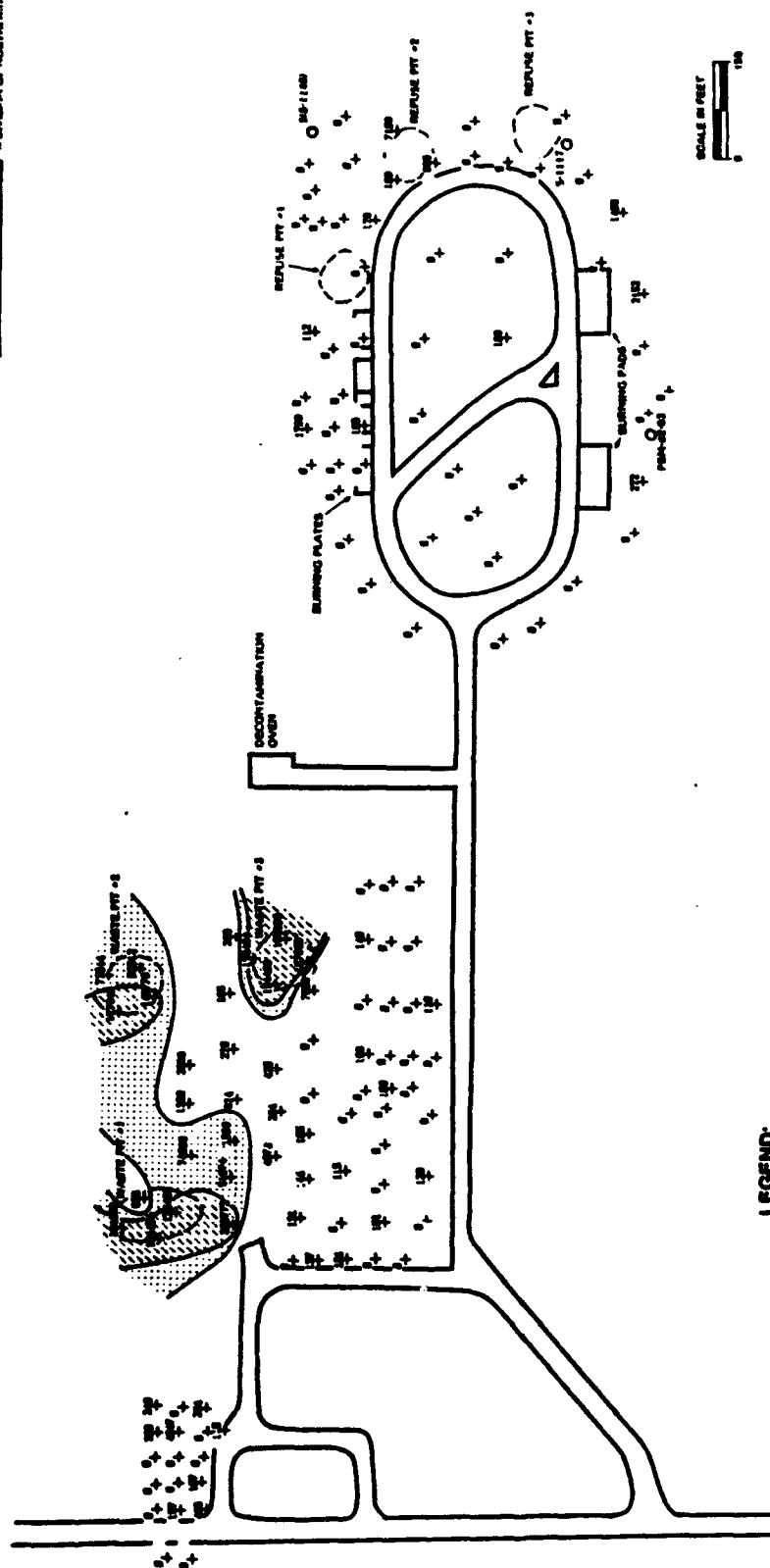
NOTE: SUBMITTED TO E.C. JORDAN ON MARCH 23, 1969 BY NEM OF LAKEWOOD, COLORADO.

FIGURE B-8
RELATIVE FLUX TETRACHLOROETHYLENE
PROPELLANT BURNING GROUND
BADGER ARMY AMMUNITION PLANT

EC-JORDANCO



PETREX
A DIVISION OF HOGUEWELL RESEARCH & DEVELOPMENT



LEGEND:
ION COUNTS
≥ 100,000
10,000 - 99,999

NOTE: SUBMITTED TO E.C. JORDAN ON MARCH 23, 1989 BY NERI OF LAKEWOOD, COLORADO.

FIGURE B-9
RELATIVE FLUX TRICHLOROETHYLENE
PROPELLANT BURNING GROUND
BADGER ARMY AMMUNITION PLANT

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A DIVISION OF PETROLEUM DEVELOPMENT CORPORATION

U.S. GEOLOGICAL SURVEY

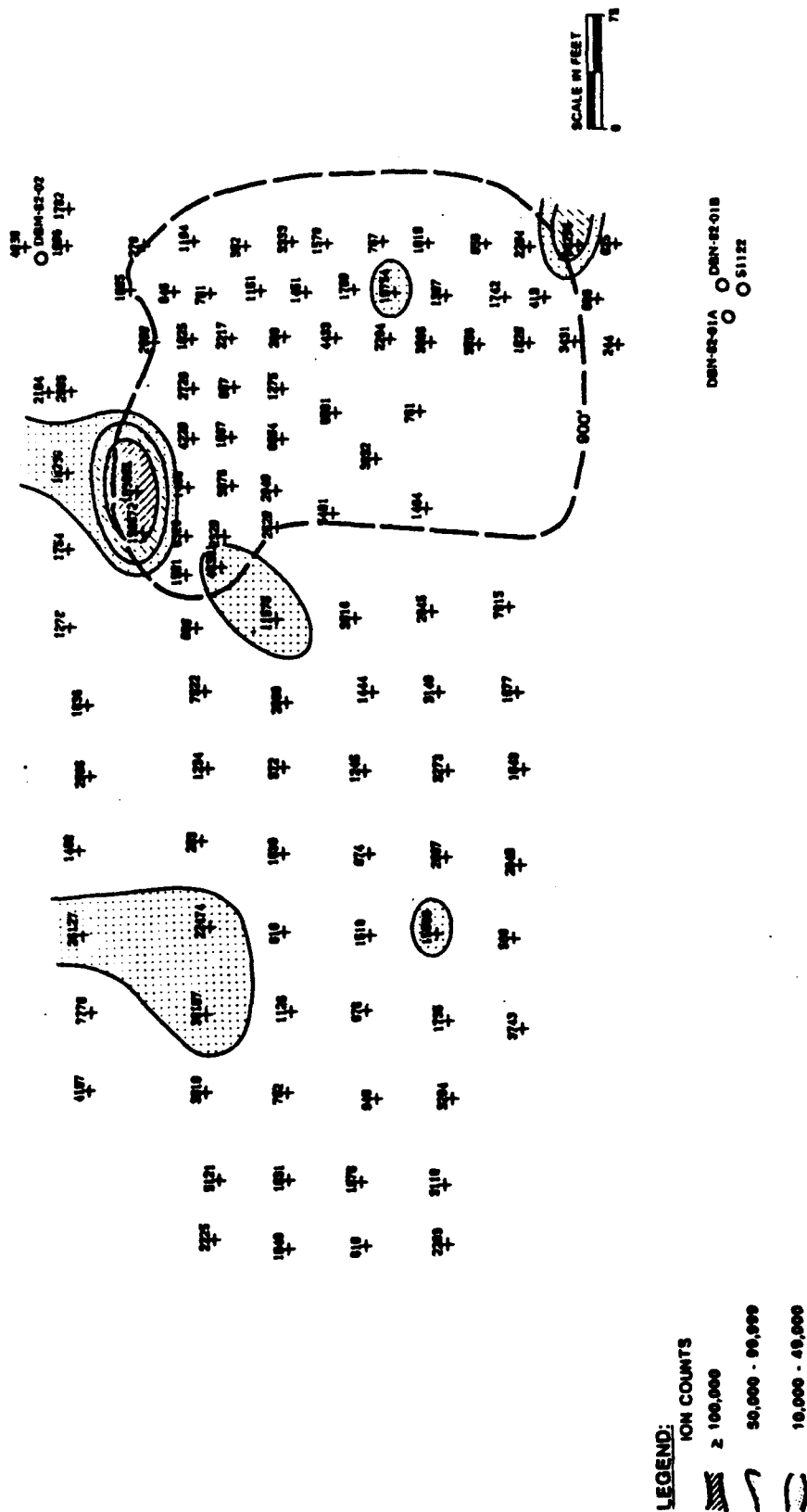


FIGURE B-10
RELATIVE FLUX SAMPLE AROMATICS
DETERRENT BURNING GROUND
BADGER ARMY AMMUNITION PLANT

ECJORDANCO

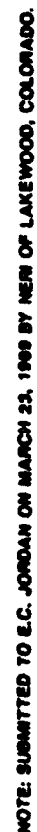


FIGURE B-11
RELATIVE FLUX ALKANES
DETERRENT BURNING GROUND
BADGER ARMY AMMUNITION PLANT

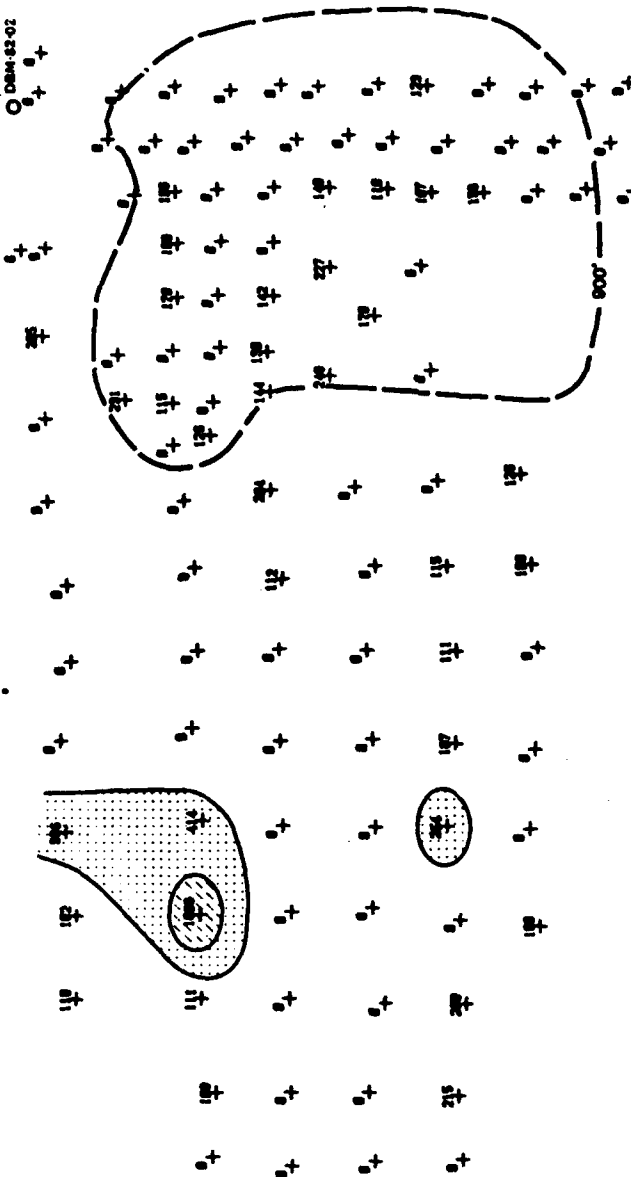
EC JORDANCO -



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DEN-82-02



SCALE IN FEET

LEGEND:
ION COUNTS
≥ 1,000
250 - 999

DEN-82-01A DEN-82-01B
DEN-82-01C DEN-82-01D

FIGURE B-12
RELATIVE FLUX TRICHLOROETHYLENE
DETERGENT BURNING GROUND
BADGER ARMY AMMUNITION PLANT
EC JORDAN CO

NOTE: SUBMITTED TO E.C. JORDAN ON MARCH 23, 1988 BY MEN OF LAKEWOOD, COLORADO.

APPENDIX C
SURFACE GEOPHYSICAL SURVEY

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APPENDIX C: SURFACE GEOPHYSICAL SURVEY

C.1 TECHNIQUES

Terrain conductivity (TC) measurements, ground-penetrating radar (GPR), and magnetometer profiling were performed at Badger Army Ammunition Plant. These techniques are described in the following subsections.

C.1.1 Terrain Conductivity Measurements

C.1.1.1 General. TC surveys, also referred to as electro-magnetic induction (EMI) surveys, have traditionally been used in mineral exploration for tracing conductive ore bodies (i.e., massive sulfides). More recently, conductivity surveys have been widely used for tracing conductive contaminant plumes in groundwater. Leachate from municipal landfills tends to be much more conductive than naturally occurring groundwater. Accordingly, the shape, extent, and relative impact of a plume can be studied with TC surveys. Such surveys have also been successfully used in studying some organic contamination in soil and groundwater since the conductivity of most organic chemicals is much lower than naturally-occurring soils and groundwater.

C.1.1.2 Data Acquisition. Data generated during field surveys were stored in a numerical data logger and were recorded on log books in the field. Since the instrument never comes in contact with the ground, data acquisition is more rapid than conventional, galvanic, earth resistivity surveys. However, quantification of conductivity data to yield a layered-earth solution is more difficult than with conventional earth resistivity.

The EM-31 DL utilized at BAAP is a widely used TC meter manufactured by Geonics, Ltd., in Mississauga, Ontario. This instrument, which has proven to be rapid-reconnaissance exploration tool, is used to assess the conductivity values for soil and rock materials.

C.1.1.3 Principles. The instrumentation for TC surveys consists of a transmitter and receiver which operates in the following manner. The transmitter is energized by an alternating current producing a magnetic field, designated as the primary field, H_p . This artificial magnetic field induces small electric currents to flow in the earth which, in turn, produce a secondary magnetic field, H_s . This secondary magnetic field is complexly related to the transmitter/receiver separation distance and to the operating frequency of the transmitter, both of which are selected by the operator. The ratio of the secondary magnetic field to the primary magnetic field (H_s/H_p), under conditions fulfilled in the field, is linearly

APPENDIX C

proportional to the TC. This ratio is measured by the receiver and converted into conductivity values in units of millimhos per meter.

C.1.1.4 Interpretation. Although it is difficult to define the thicknesses and "true" conductivity of individual subsurface layers, the instrument precisely measures the "apparent" conductivity of a volume of underlying earth materials. The apparent conductivity is comprised of the sum of the contributions from each layer that is "sampled" by the transmitter-receiver array. The volume (and therefore the depth) of earth materials sampled increases with increasing separation between the transmitter and receiver. This separation is fixed at 3 meters with the EM-31.

The instrument can be used in either the horizontal dipole or vertical dipole mode. Selection of the operational dipole mode depends on the depth of sampling desired, and the desired sensitivity of the instrument to materials at various depths, relative to the transmitter-receiver coil separation. Table C-1 shows the relationship of the vertical and horizontal dipole modes and coil separation to the effective depth of exploration.

The relative response of the instrument to materials at various depths can be estimated by examining Figure C-1, which shows a comparison of the relative responses for vertical and horizontal dipoles. The vertical axis describes the relative contribution to the secondary magnetic field, arising from a thin layer at a given depth, z . The horizontal axis shows how this response varies as a function of the ratio (z/s), where z is the depth of the thin layer described previously and s is the transmitter/receiver separation.

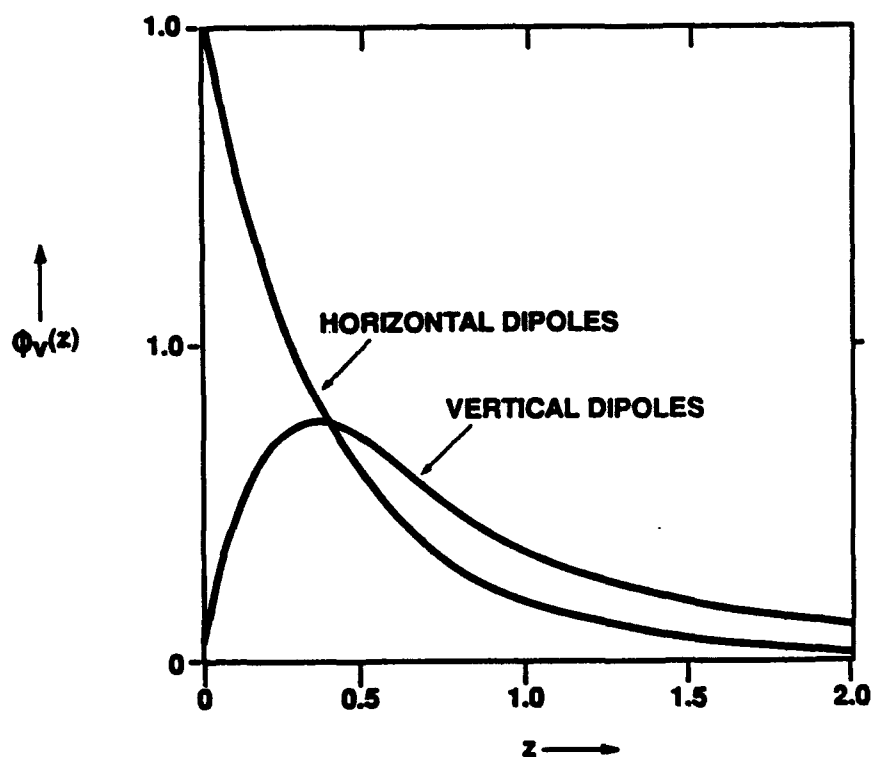
Figure C-1 demonstrates that in the vertical dipole mode, the contribution to the secondary magnetic field from near-surface materials is very small but reaches a maximum at a depth z of approximately 40 percent of s . The contribution is significant, although diminished, at a depth of 150 percent of s . This depth represents the effective depth of exploration in the vertical dipole mode (see Table C-1).

In the horizontal dipole mode, the contribution to the secondary magnetic field arising from near-surface materials, is a maximum and decreases with increased depth. The contribution is also significant at a depth of about 75 percent of s . This depth represents the effective depth of exploration in the horizontal dipole mode (see Table C-1). The location and results of TC surveys at the Deterrent Burning Ground and Landfill 1 are discussed in Section 6.1.

TABLE C-1
TERRAIN CONDUCTIVITY MEASUREMENTS
EFFECTIVE DEPTH OF EXPLORATION

REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

INSTRUMENT	COIL SEPARATION	VERTICAL DIPOLE	HORIZONTAL DIPOLE
EM 31	3m	4.5m	2.25m
EM 34-3	10m	15m	7.5m
	20m	30m	15m
	40m	60m	30m



NOTE: " $\Phi_v(z)$ " is the relative contribution to the secondary magnetic field intensity from material in a thin layer (dz) located at (normalized) depth " z ."

" z " is the depth of the thin layer (dz) divided by the intercoil spacing between transmitter and receiver.

**FIGURE C-1
TERRAIN CONDUCTIVITY SURVEY
COMPARISON OF RELATIVE
RESPONSES FOR VERTICAL
AND HORIZONTAL DIPOLES
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT
ABB Environmental Services, Inc.**

C.1.2 Ground Penetrating Radar Profiling

C.1.2.1 Introduction. The GPR technique uses high frequency radio waves to determine the presence of subsurface objects and structures. Energy is radiated downward into the subsurface from an antenna which is pulled slowly across the ground at speeds varying from about 0.25 to 5 mph, depending upon the amount of detail desired and the nature of the target. The radio wave energy is reflected from surfaces where there is a contrast in the electrical properties of subsurface materials. These surfaces may be naturally-occurring geologic horizons (soil layers, changes in moisture content, voids and fractures in bedrock) or manmade (buried utilities, tanks, drums, etc.). The reflected energy is processed and displayed as a continuous strip chart recording of distance versus time (where time can be thought of as proportional to depth).

The depth of penetration of a GPR system is highly site-specific, and depends, among other factors, on (1) the soil types at the site (clean sands are best), (2) moisture conditions (dry is best), and (3) the frequency of the antenna (the lower the frequency, the deeper the penetration, and the less the resolution capability).

Typical applications for GPR include delineating the boundaries of buried hazardous waste materials and the perimeters of abandoned landfills; finding steel reinforcement bars and voids in concrete structures; recording the depth of geological interfaces, bedrock, and coal seams; locating and mapping buried utilities; bottom and shallow subbottom profiling on lakes; and determining glacial ice stratification and thickness.

C.1.2.2 Principles. The radar system consists of a control unit, an antenna assembly (transmitter/receiver), and a recording device for analog field recordings. A tape recording unit may also be present for further data processing after field activities are completed. The antenna transmits electromagnetic (EM) pulses of short duration into the ground. The pulses are reflected from geologic or man-made surfaces and are picked up by the receiver which transmits the signals to the control unit for processing and analog display. Shallow objects appear near the top of the strip chart recording (less time elapsed between the outgoing pulse and the return of reflected energy), whereas deeper objects appear further down the recording (more time elapsed).

The time required for the EM pulse to traverse the path down to and back from the reflecting medium is measured in nanoseconds (ns), where 1 ns equals 1×10^{-9} seconds. The two-way travel time is proportional to the burial depth of the reflecting medium and is dependent upon the dielectric properties of the medium through which the EM pulse

APPENDIX C

travels. The dielectric properties of a medium are related to the moisture content and composition of a material.

Figure C-2 depicts the relationship between a single EM pulse generated by the controller and the resulting strip chart recording which would result from many such EM pulses (by permission of GSSI, Inc.). Figures C-3 and C-4 illustrate various features as they would appear on a GPR recording.

The propagation velocity of the EM pulse is determined by the relative dielectric permittivity (ϵ_r) of the material through which the pulse travels. The ϵ_r is a measure of the degree to which a medium can resist the flow of the EM pulse: the higher the ϵ_r , the lower the resistance to flow, and vice versa. For most earth materials and rocks, the ϵ_r does not exceed 10 and is always greater than 1, the value for a vacuum. Table C-2 gives typical permittivity values for commonly encountered materials. The ϵ_r is related to the propagation velocity by the formula

$$(1) \epsilon_r = (c/V_m)^2,$$

where "c" is the propagation velocity in free space (3×10^8 meters per second or approximately 1 foot per ns), and V_m is the propagation velocity through a material. It follows that $\epsilon_r^{0.5} = c/V_m$ or $1/V_m = [\epsilon_r^{0.5}]/c$. Since $c = 1 \text{ ft/ns}$, then

$$(2) 1/V_m = \epsilon_r^{0.5},$$

where units are in ns/ft (one-way travel time).

Formula (2) gives a method for estimating the propagation velocity for a medium (and therefore the depth to a reflecting horizon) if the soil conditions are known. If they are unknown or their properties cannot be estimated accurately enough, a reflector of known depth can often be used to calibrate the GPR recordings to site conditions.

C.1.3 Magnetometer Survey

C.1.3.1 Introduction. The magnetometer survey is a versatile, relatively inexpensive, geophysical exploration technique. The focus of national attention on the hazardous waste problem has prompted the routine use of magnetometers for locating repositories of buried (drummed) wastes. Locating and quantifying these materials is essential to any remediation effort, and magnetometer surveys can provide an extra measure of safety to those personnel involved in the clean-up activities.

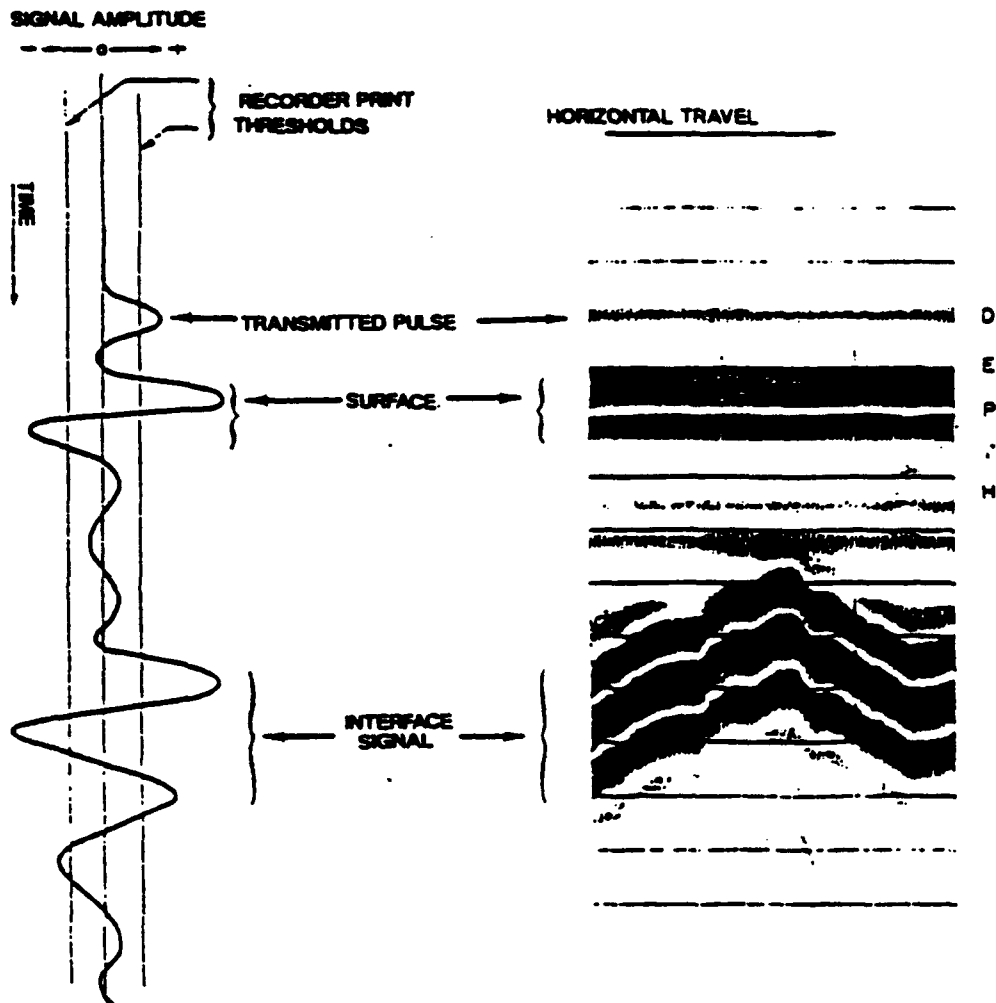


FIGURE C-2
TYPICAL GPR SYSTEM DATA
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT
ABB Environmental Services, Inc.

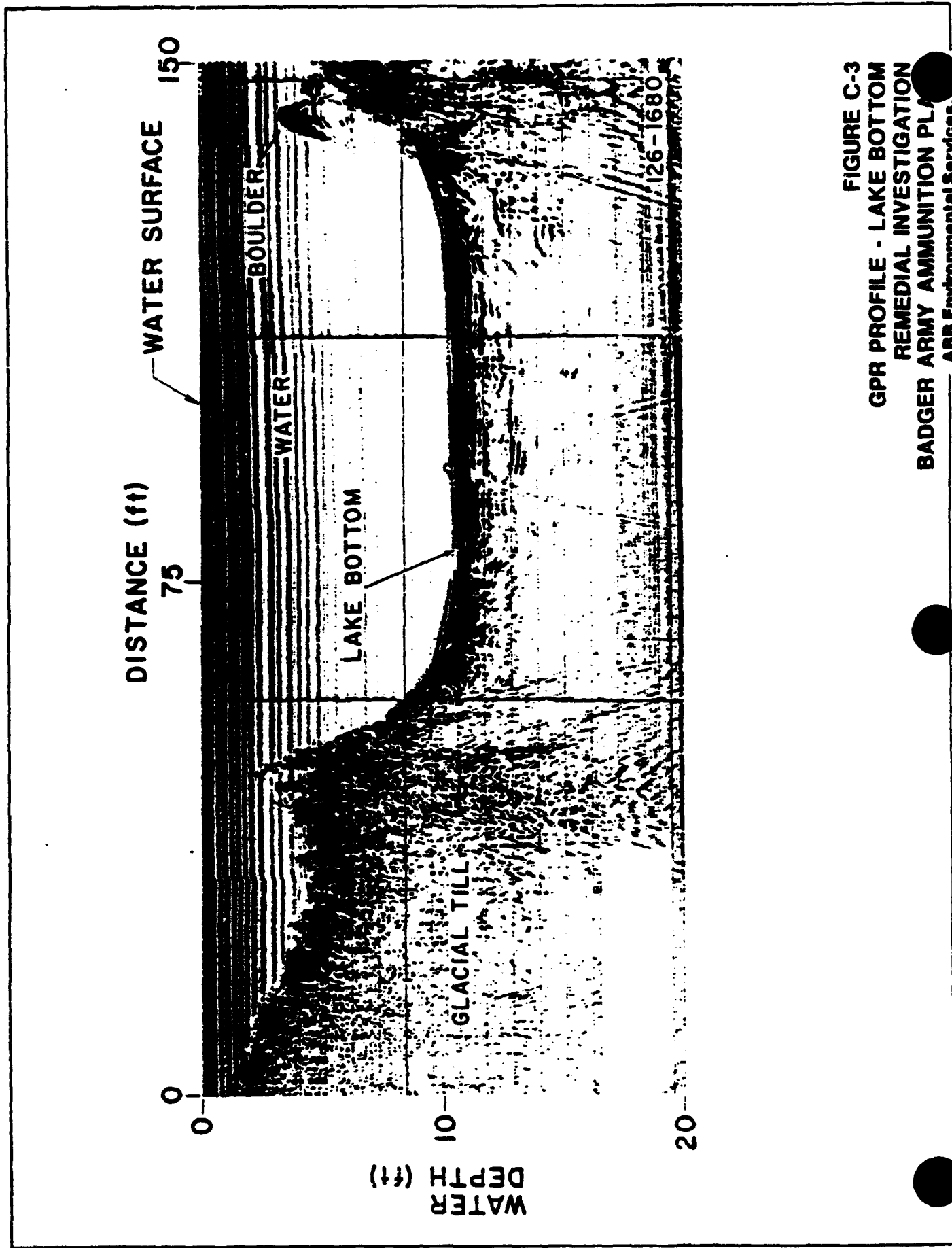


FIGURE C-3
GPR PROFILE - LAKE BOTTOM
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT
ABB Environmental Services,

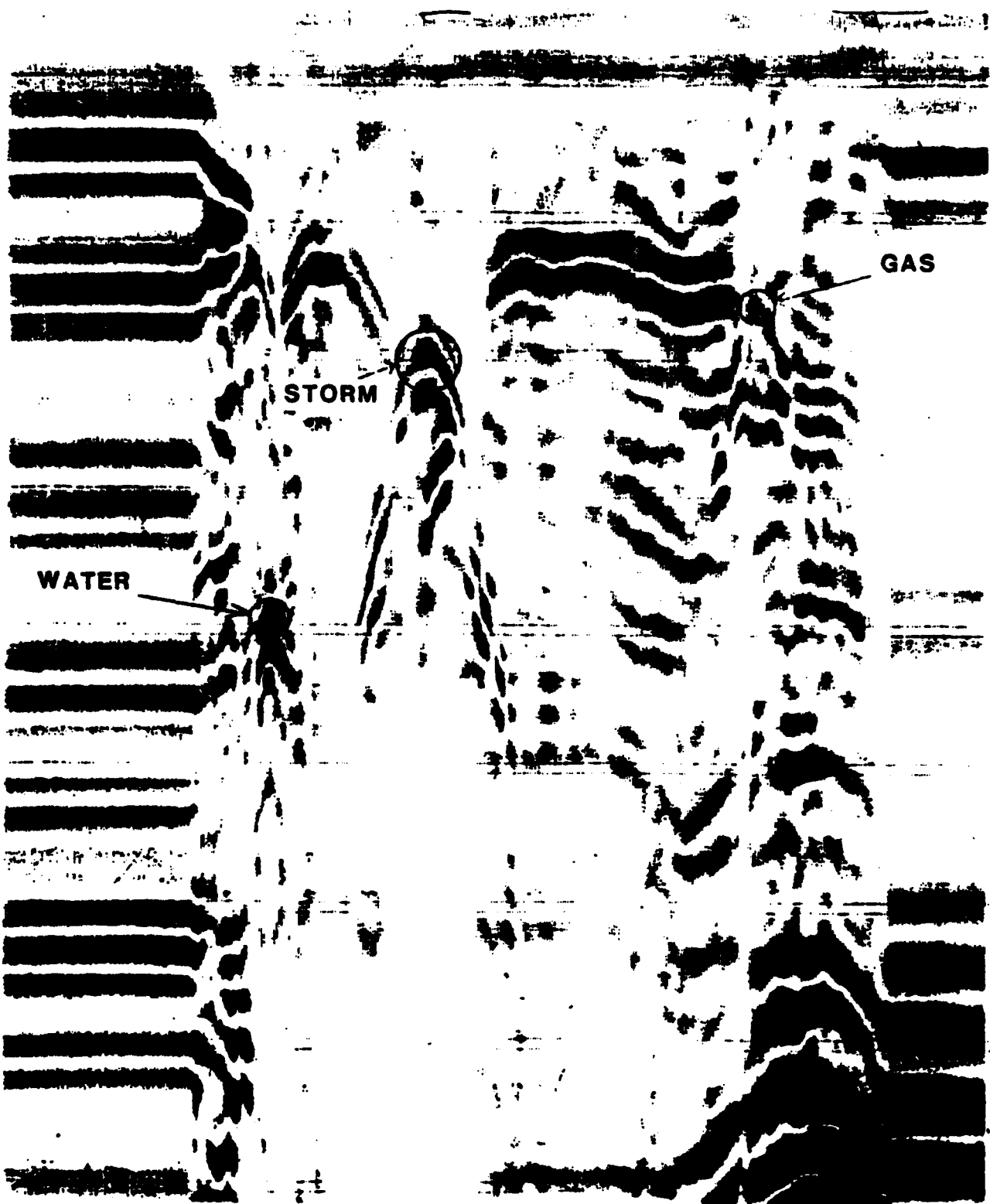


FIGURE C-4
GPR PROFILE - BURIED UTILITIES
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT
ABB Environmental Services, Inc.

TABLE C-2
APPROXIMATE VHF ELECTROMAGNETIC PROPERTIES
OF VARIOUS MATERIALS*

REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

MATERIAL	RELATIVE DIELECTRIC PERMITTIVITY	PULSE VELOCITY (NS/FT)
<i>air</i>	1	1
<i>freshwater</i>	81	9
<i>seawater</i>	81	9
<i>sand (dry)</i>	4-6	2-2.4
<i>sand (saturated)</i>	30	5.5
<i>silt (saturated)</i>	10	3.1
<i>clay (saturated)</i>	8-12	2.8-3.3
<i>average dirt</i>	16	4.0
<i>dry sandy coastal land</i>	10	3.1
<i>marshy forested flatland</i>	12	3.5
<i>rich agricultural land</i>	15	3.9
<i>pastoral land, hilly, forested</i>	13	3.6
<i>freshwater ice</i>	4	2.0
<i>permafrost</i>	4-8	2.0-2.9
<i>granite (dry)</i>	5	2.2
<i>limestone</i>	7-9	2.6
<i>concrete</i>	6.4	2.5
<i>asphalt</i>	3-5	1.7-2.5

* Modified from Geophysical Survey Systems, Inc.

C.1.3.2 Principles. At BAAP a "proton precession" type magnetometer was employed. This device utilizes the precession of spinning protons of hydrogen atoms in a sample of hydrogen-rich fluid (e.g., kerosene, alcohol, or water) to measure the total magnetic field intensity. Protons spinning in an atomic nucleus behave like tiny magnetic dipoles which can be aligned (polarized) by an external magnetic field. The protons are initially aligned parallel to the earth's field. A second, much stronger magnetic field is produced approximately perpendicular to the earth's field by introducing electric current through a coil of wire. The protons become temporarily aligned with this stronger field. When this stronger field is removed, the protons tend to realign themselves with the earth's field, causing them to precess about this direction at a frequency of approximately 2,000 Hz. The precessing protons will generate a small electric signal in the same coil used to polarize them with a frequency proportional to the total magnetic field intensity and independent of the coil orientation. By measuring the signal frequency, one can obtain the absolute value of the total earth's field intensity to an accuracy of 1 gamma or better. The total magnetic field value measured by the proton precession magnetometer is the net vector sum of the ambient earth's field and any local induced and/or remanent (permanent) perturbations.

C.1.3.3 Interpretation. For typical manmade iron or steel objects, the approximate depth of burial and the amount of metal that produces an observed magnetic perturbation (or anomaly) may be quantified. The size of the anomaly (T) can be expressed as:

$$T = M/r^n$$

where "M" is the magnetic moment of the source "r" is the depth to the source, and "n" is a measure of the rate of decay with distance (n = 3 for a dipole source and 2 for a monopole source).

Assuming a dipole source, the weight of a metal object (in pounds) can be expressed by the following relation:

$$\text{Weight} = (T \cdot r^3)/M$$

where "M" is the magnetic moment per pound of iron and varies from approximately 175 to 1750, "r" is the depth in feet (below the sensor), and "T" is the anomaly amplitude in gammas.

The depth, "r", of a magnetic source can be estimated by a number of techniques, but perhaps the simplest is by the "half-width" rule. This states that for simple anomaly sources, the depth to the center of the anomaly is equal to the "half-width" of the anomaly. The half-

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width is the horizontal distance between the maximum value of the anomaly and the point at which the value is half the maximum value (Figure C-5).

A further refinement in magnetic studies is permitted with the addition of vertical gradient measurements. This involves the simultaneous acquisition by two sensors of two values of the total field. The sensors are mounted on a staff that is held vertically during a measurement. A known distance (commonly half or 1 meter) separates the sensors on the staff. The vertical gradient value is derived by obtaining the difference between the total field values of the lower and upper sensors divided by the distance between them. Vertical gradient measurements tend to be more sensitive to the presence of near-surface metal objects than total field values alone.

There are commercially available magnetometers that record field data in an internal memory, which can be "dumped" at the completion of field activities onto a personal computer. These instruments can record the total field value, the vertical gradient, the time and date of the measurement, and the station location (input by the user), as well as a number of parameters that permit an evaluation of data quality. When vertical gradient measurements are the primary focus of a survey, the diurnal variation is inconsequential, because any variation affects the two sensors on the magnetometer sensor staff equally.

C.2 RESULTS

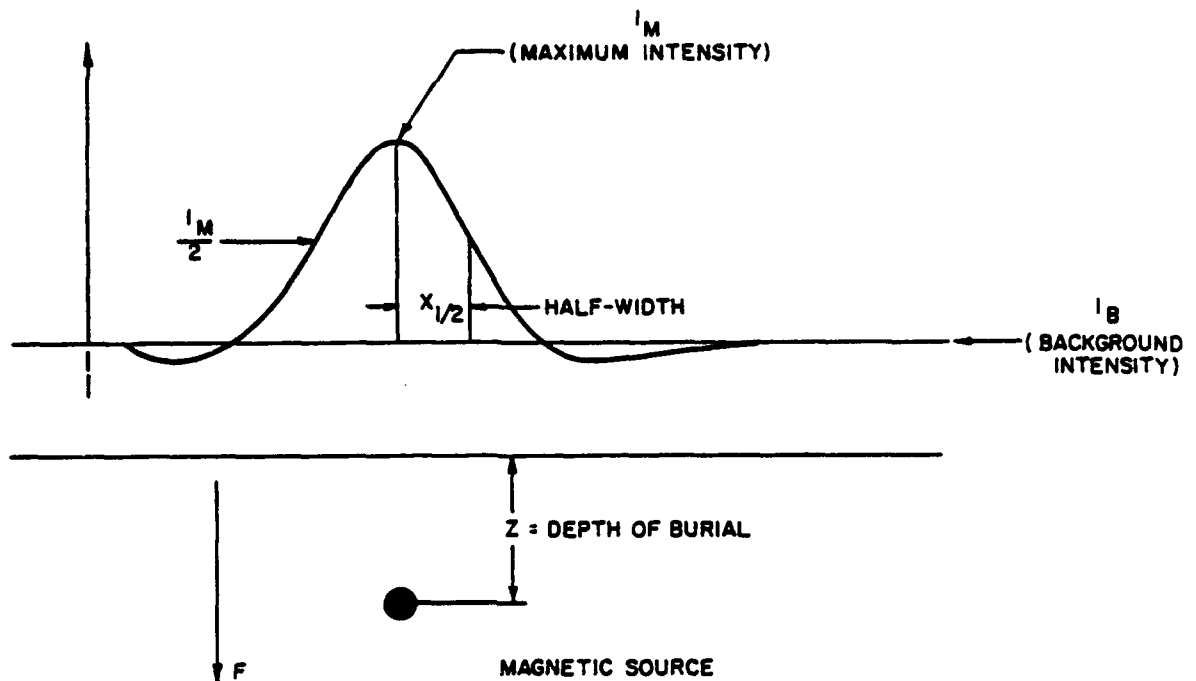
The results of the TC, GPR, and magnetometer surveys conducted at Landfill 1, the Deterrent Burning Ground, and the 1949 Pit are presented in this section.

C.2.1 Landfill 1

A geophysical survey, consisting of both TC measurements and GPR profiling, was conducted at Landfill 1. The purpose for this work was to accurately define the boundaries of the landfill. A 100- by 100-foot survey grid was established prior to the start of field work to serve as lateral control for the measurements to follow. Jordan accomplished this with a compass and fiberglass tape and tied the survey grid into landmarks, where possible.

A Geonics EM-31DL Terrain Conductivity Meter was used for the TC survey. Measurement stations were established every 20 feet within the survey area, and all stations were referenced to the 100- by 100-foot grid. Measurements were recorded on a digital data logger, and included both the quadrature- phase and in-phase components of the induced magnetic field. The quadrature- phase component gives the TC value in millimhos per

DEPTH CALCULATION/METAL QUANTITY
FOR TOTAL FIELD MEASUREMENTS:



T = MAGNETIC ANOMALY INTENSITY

= MAXIMUM ANOMALY INTENSITY MINUS BACKGROUND INTENSITY

$$= I_M - I_B$$

$$= \frac{M_{fps}}{r^3} = \frac{1.75 \times 10^2 \text{ to } 1.75 \times 10^3}{(1 \text{ to } 2) r^3}$$

where " M_{fps} " is the magnetic moment per pound of iron and " r " is the distance between the magnetometer sensor and the object (the depth of burial) " z " is equal to " r " minus the height of the sensor above the ground.

DEPTH CALCULATION FOR GRADIOMETER MEASUREMENTS

$$r = \frac{-nT}{\frac{dT}{dz}}$$

where " n " is the "falloff" factor and generally varies from 1 to 2, depending on the magnetic source, " r " is the separation between the midpoint between the two sensors and the object.

FIGURE C-5
MAGNETOMETER DATA INTERPRETATION
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

ABB Environmental Services, Inc.

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meter. The in-phase component, used primarily for calibration purposes on the EM-31, is significantly more sensitive to metallic objects and, hence, is useful for looking for buried metallic objects, such as tanks and drums. Data from the in-phase component may be thought of as being equivalent to a metal detector survey.

A GSSI SIR System III GPR system with 500 MHz antenna was used for the GPR survey. GPR traverses were made at 10-foot intervals in three separate areas within Landfill 1.

The results of the TC and GPR surveys are presented as Figures C-6 through C-8. Figure C-6 presents the TC quadrature-phase contours (ground conductivity). Figure C-7 portrays the TC in-phase contours (sensitive to metallic objects). Figure C-8 presents the landfill perimeter as mapped by these survey results (including the GPR results).

The only significant anomaly on Figure C-8 is an east-west-oriented elliptically-shaped TC "high" in the central portion of the study area (labeled TC-H3). TC-H3 is undoubtedly caused by the presence of metallic refuse and the production of electrically conductive leachate by infiltration of surface water runoff.

GPR traverses were located as indicated on Figure C-8. The transition across the boundary separating natural sediments from the refuse disposed in the landfill is characterized by strong, shallow reflections typical of landfills (Refuse typically retains moisture which generates electrically conductive leachate, producing a large contrast in the electrical properties of subsurface materials). The landfill boundary mapped during the field survey is indicated on Figure C-8. There is a striking similarity between the boundary mapped by GPR and the TC contours presented in Figure C-6 (the 8 millimho per meter contour has been superimposed onto Figure C-8 for illustrative purposes).

C.2.2 Deterrent Burning Ground

The purpose for geophysical surveys at the Deterrent Burning Ground was to locate former pits in which the burning of deterrent took place. Field methodology and instrumentation for the surveys were discussed in Section C.2.1. Information derived from these field activities was used for planning the locations for explorations, including both monitoring wells and test pits.

The results of the geophysical surveys at the Deterrent Burning Ground are presented in Figures C-9 through C-11. Figure C-9 presents the TC quadrature-phase contours (ground conductivity). Figure C-10 portrays the TC in-phase contours (more sensitive to the

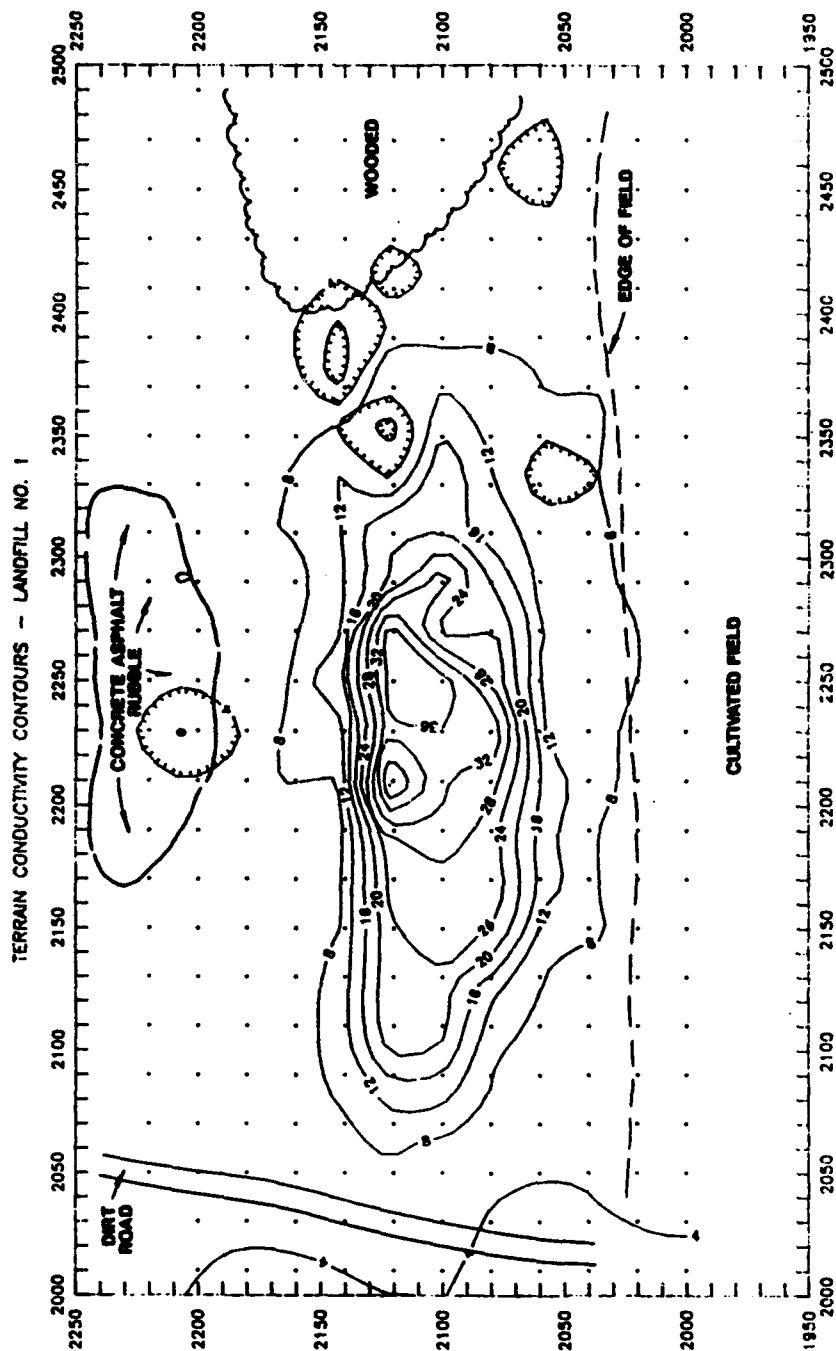


FIGURE C-6
TERRAIN CONDUCTIVITY
QUADRATURE PHASE CONTOURS
LANDFILL 1
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT
AES Environmental Services, Inc.

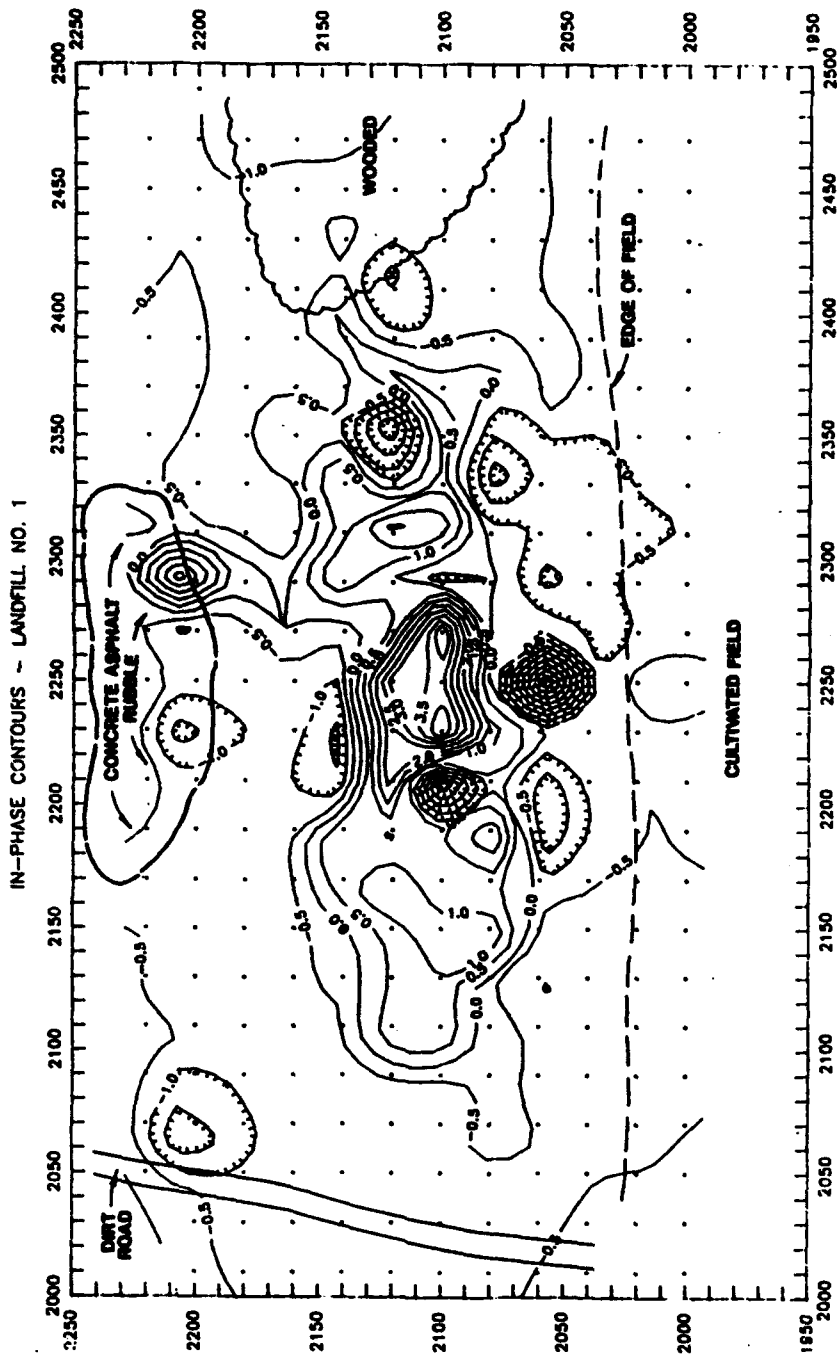


FIGURE C-7
TERRAIN CONDUCTIVITY IN-PHASE CONTOURS
LANDFILL 1
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT
AMS Environmental Services, Inc.



SITE INVESTIGATION PLAN - LANDFILL NO. 1

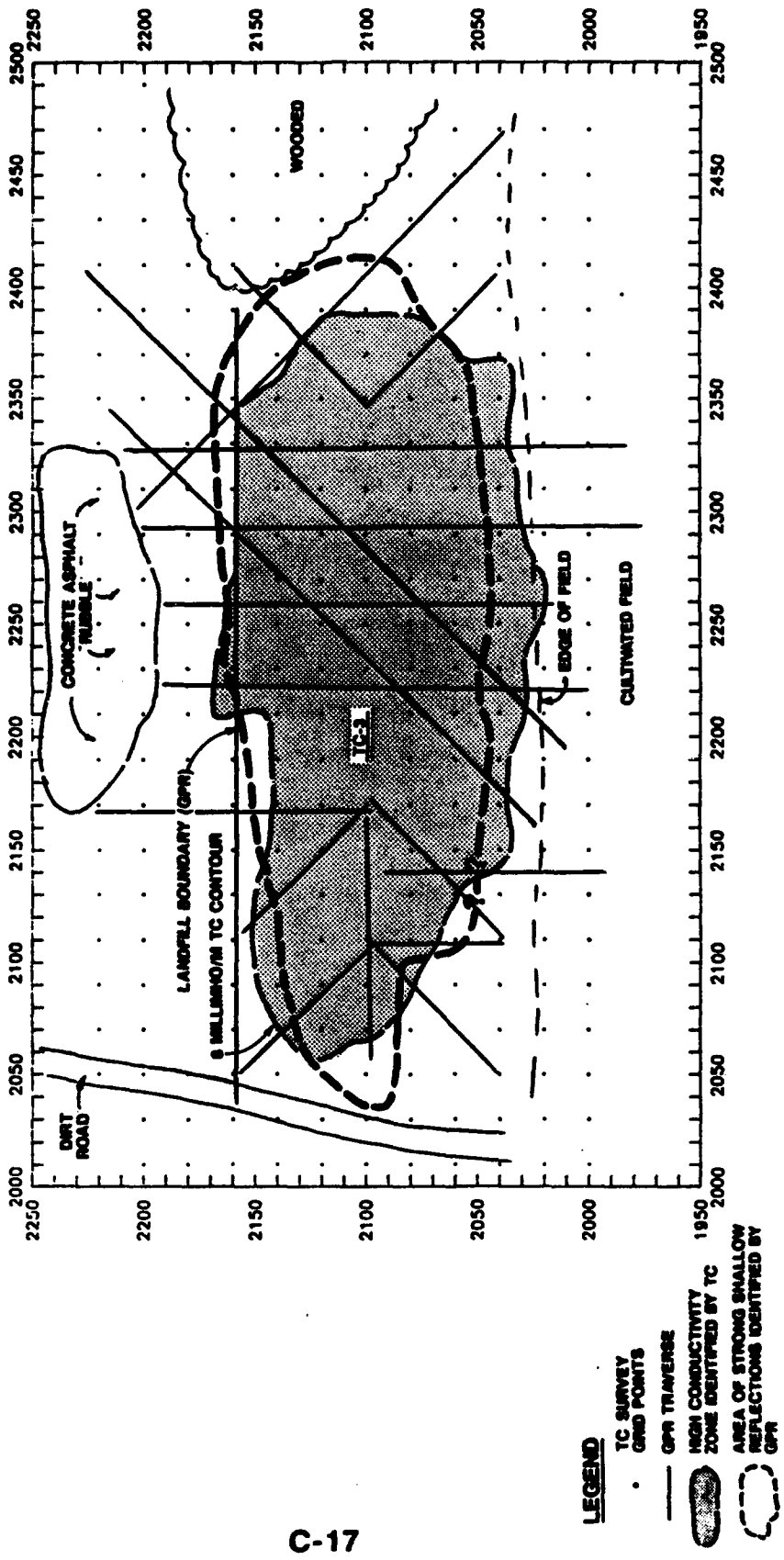


FIGURE C-8
SUMMARY OF GEOPHYSICAL SURVEY RESULTS
LANDFILL 1
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT
AEB Environmental Services, Inc.

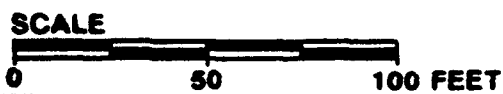
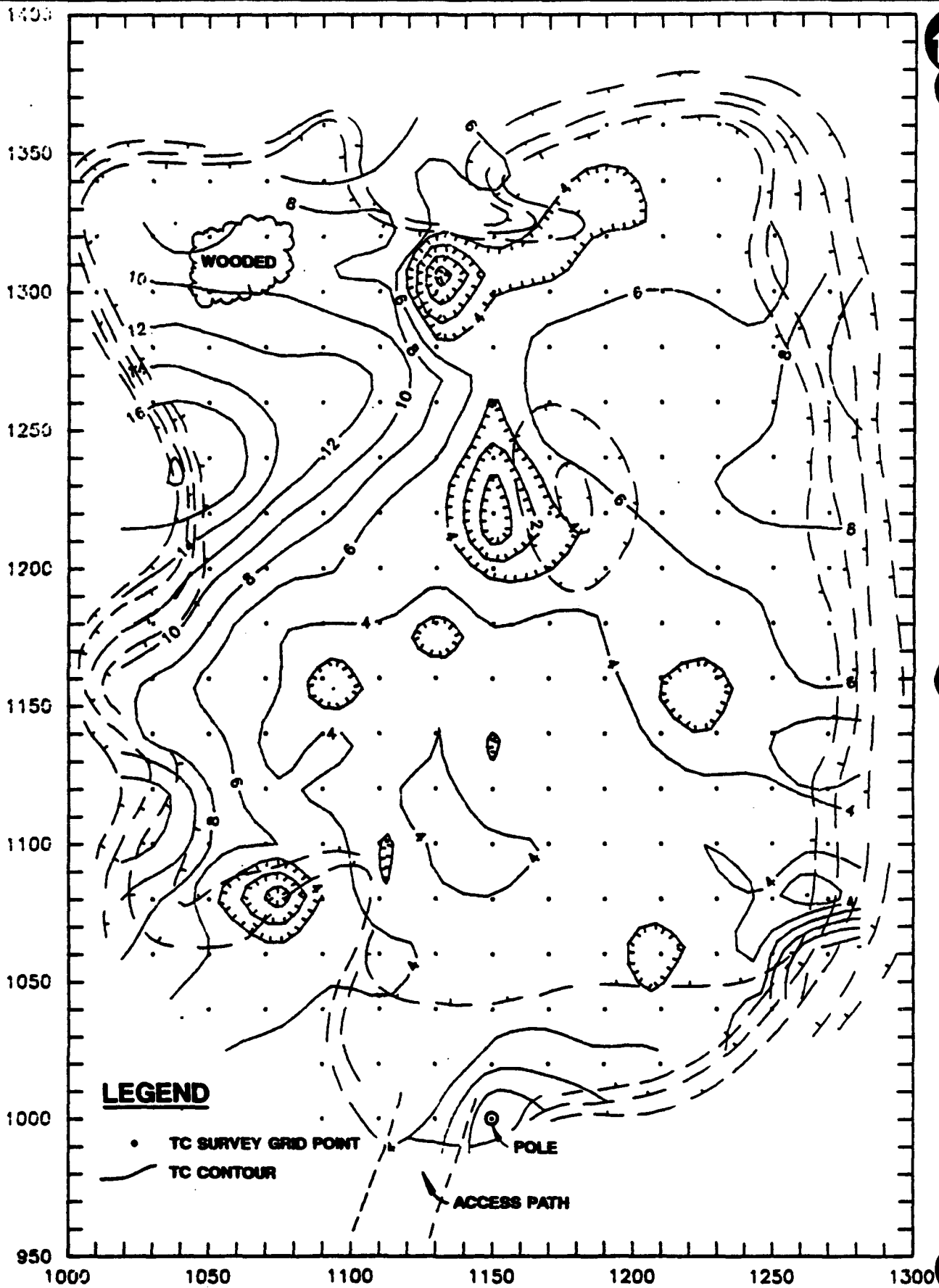


FIGURE C-9
TERRAIN CONDUCTIVITY QUADRATURE PHASE CONTOURS
DETERRENT BURNING GROUND
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT
ABB Environmental Services, Inc.

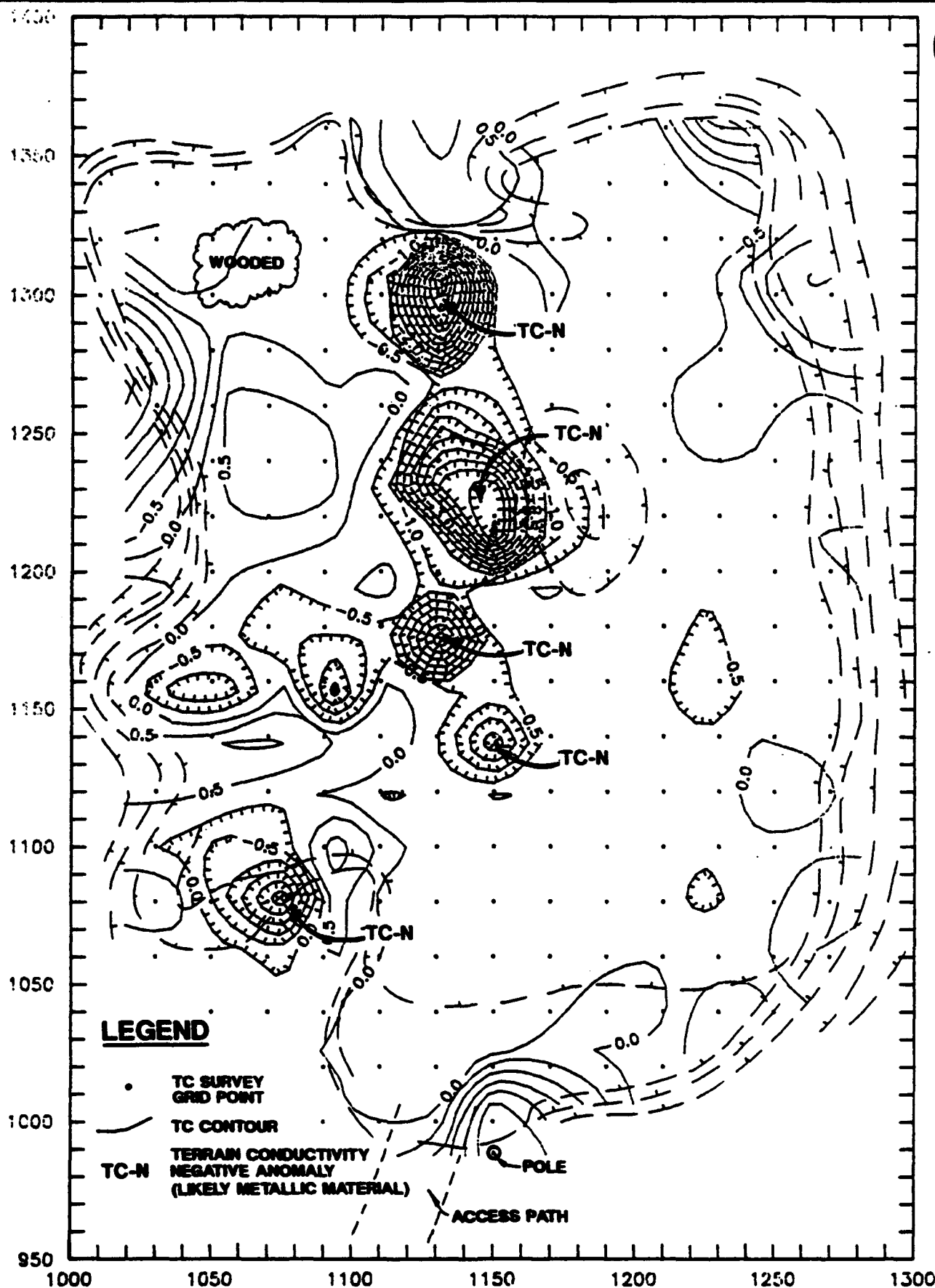
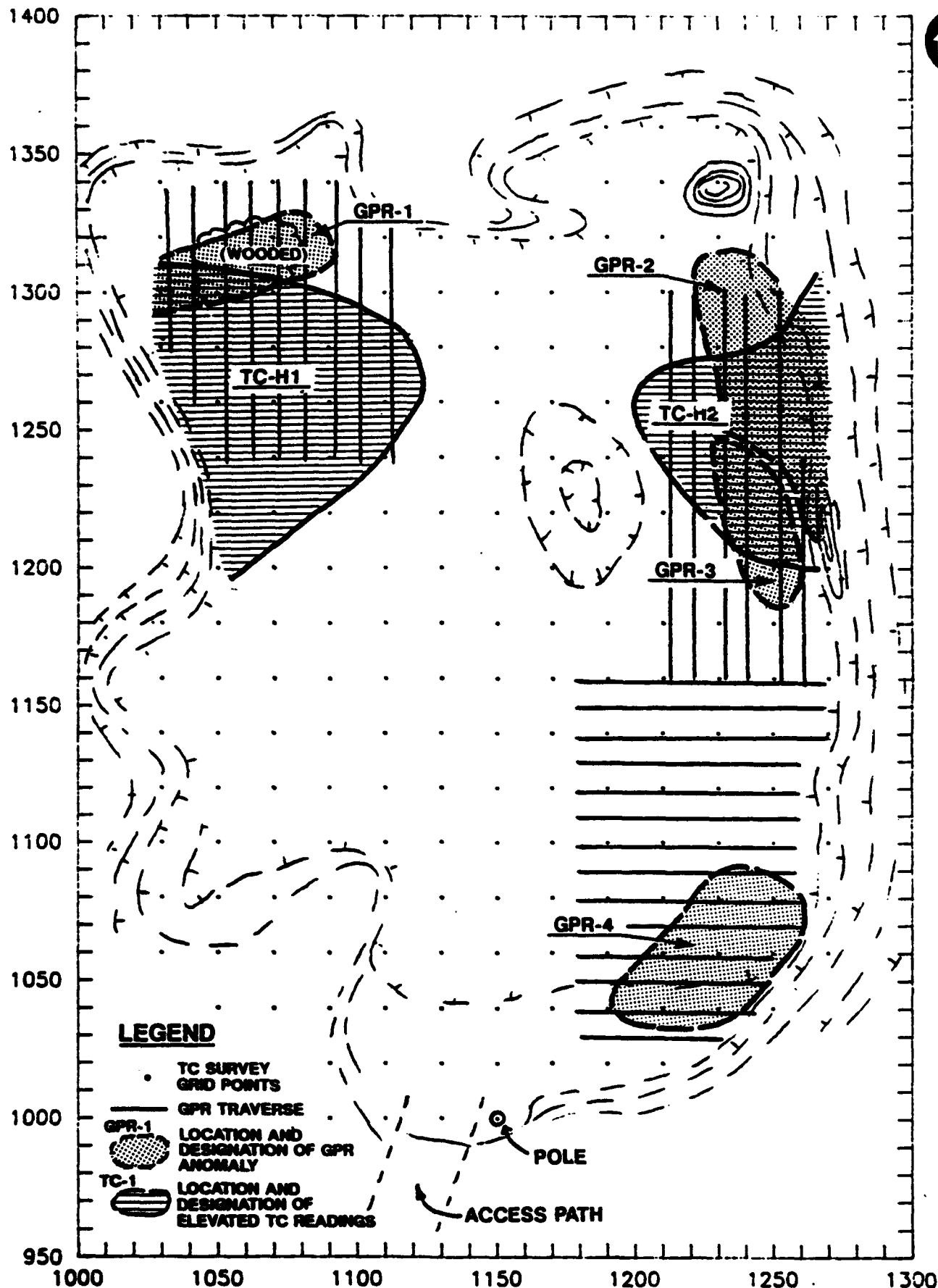


FIGURE C-10
TERRAIN CONDUCTIVITY IN-PHASE CONTOURS
DETERRENT BURNING GROUND
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT
 ABB Environmental Services, Inc.



presence of metallic objects). Figure C-11 summarizes the subsurface features which were mapped (including the GPR results).

GPR measurements were made in the Deterrent Burning Ground in those portions of the site where historical records and aerial photographs revealed pit locations where burning activities took place. GPR traverses were made at 10-foot intervals in these locations. Figure C-11 shows the locations of the traverses made in three separate areas within the Deterrent Burning Ground.

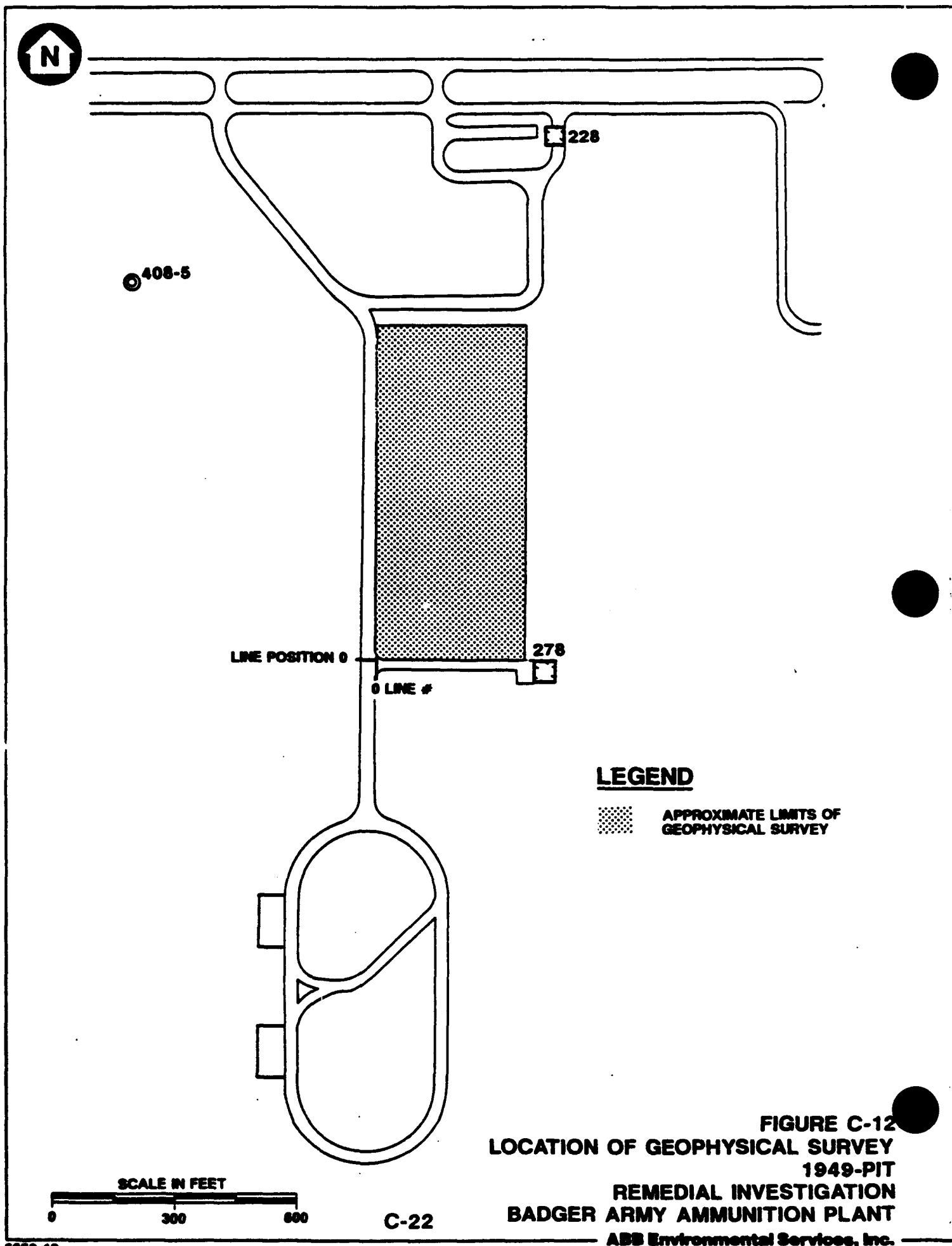
Two ground conductivity anomalies are evident on Figure C-9 in the northwest and northeast portions of the site (these are also shown on the summary map, Figure C-11). The negative anomalies on Figure C-10 (labeled TC-N) are probably caused by metallic debris either at the surface or buried close to the surface.

The most prominent anomaly on the summary map, Figure C-11, is a broad TC "high" in the northwest portion of the study area. This feature is labeled TC-H1. Site records indicate that the high ground west of TC-H1 was excavated and subsequently backfilled with refuse. It is probable that TC-H1 is an anomaly created by the generation of electrically conductive leachate in groundwater. A second, less pronounced TC high is located in the northeastern portion of the study area (labeled TC-H2). This anomaly is possibly related to the old deterrent burning pit, but it is diffuse and thus not useful for locating test pits or borings.

GPR traverses were made in the northwestern corner and along the eastern flank of the Deterrent Burning Ground (Figure C-11). Four anomalous zones were mapped (GPR-1, GPR-2, GPR-3, and GPR-4). Anomalies GPR-1 and GPR-2 are similar in that they are characterized by a distinct lack of reflections from subsurface strata. The reason for this is not known, but could be related to past site activities. Anomalies GPR-3 and GPR-4 are also similar to one another: they are characterized by shallow, moderate to strong reflections common in landfills. Refuse typically retains moisture which generates electrically conductive leachate, producing a large contrast in the electrical properties of subsurface materials.

C.2.3 1949 Pit

A geophysical survey consisting of both magnetometer and GPR surveys was conducted at the 1949 Pit at the Propellant Burning Ground. Prior to any magnetic measurements or GPR profiling, a 260-by-600 foot survey area with a 20 foot grid spacing was established using pin-flags, a compass, and a 100 foot tape. The survey grid was tied to the asphalt road bordering the eastern edge of the study area (Figure C-12). Grid points along the edge of



the road (Line 000) were marked accordingly at 50 foot intervals with orange spray paint. Twenty foot intervals were marked on the road bordering the northern portion of the study area.

The geophysical investigation consisted of two surveys. Magnetometer and GPR surveys were used in conjunction with one another to help confirm the presence and location of buried metallic objects and the presence of former excavations. Magnetometer data aids in the detection of buried ferrous materials while GPR data helps to define the edges of excavations and can also detect the presence of metallic objects. Analysis of historical records and aerial photographs of the site from 1947 up to the present strongly suggested that the 1949 Pit Area of the Propellant Burning Ground may be an area where significant amounts of buried ferrous materials exist. A brief description of each survey follows.

For the magnetometer survey, an EDA Instruments Omni Plus Vertical Gradiometer was utilized for data acquisition. A total of 434 magnetic station measurements were taken within the pre-established 260 by 600 foot grid. Additionally, a magnetic base station was established to monitor diurnal variations in the earth's magnetic field. Base station readings (Table C-3) were taken approximately once per hour during the course of the magnetometer survey. Base station values fall within the range of expected diurnal variation.

All magnetic data were recorded in the instrument's internal data logger and down-loaded to a personal computer at the conclusion of each field day. These data were compiled and contoured using various computer applications software. Data evaluation was conducted in the field both during the survey and after initial computer processing.

Results from the magnetometer survey are presented in the form of vertical gradient contours (Figure C-13). Superimposed are surficial metallic objects encountered during the survey. Surface metallic debris consisted primarily of crushed powder drums, fence cable, and electrical cable. Based on the magnetic signature characterizing the site in Figure C-13, the site was divided into two areas. Area 1 contains significant amounts of buried ferrous materials. Area 2, on the other hand, is unlikely to contain any large quantities of buried ferrous materials. A discussion of both areas follows.

Area 1. Figure C-13 illustrates the magnetic signature of the 1949 Pit. The area showing the greatest concentration of magnetic anomalies was designated as Area 1. The magnetic signature of Area 1 is indicative of significant amounts of ferrous materials buried throughout this portion of the study area. These magnetic anomalies are found within a 500

**TABLE C-3
BASE STATION VALUES
MAGNETOMETER SURVEY
AUGUST 21-22, 1990**

**REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT**

DATE	TIME	TFV¹
08/21	17:54	57318.5
08/21	18:19	57289.6
08/22	07:47	57152.8
08/22	08:47	57168.9
08/22	09:17	57166.5
08/22	10:42	57165.6
08/22	11:34	57159.5

Notes:

¹ Total (magnetic) field value, in gammas.

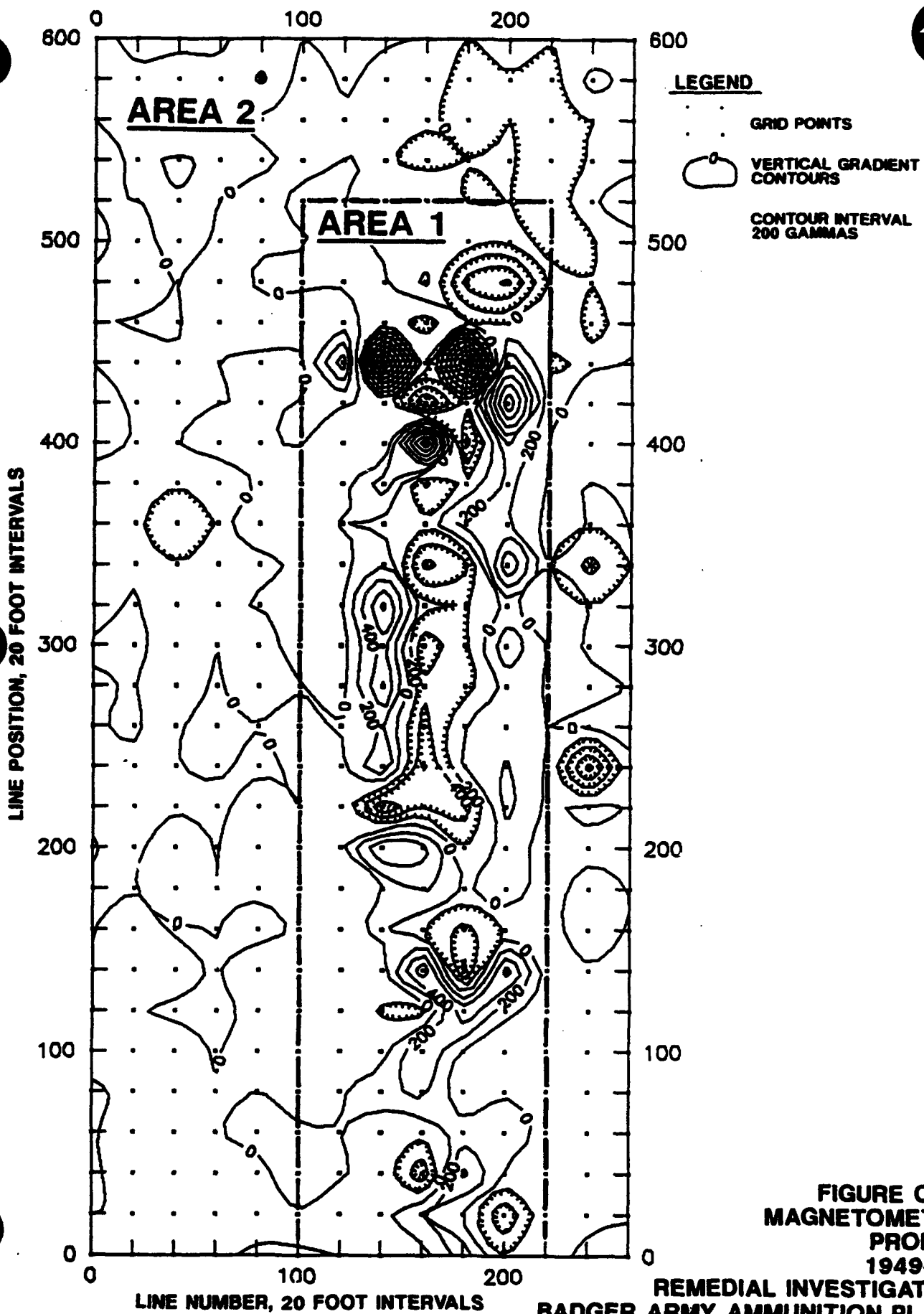


FIGURE C-13
MAGNETOMETER
PROFILE
1949-PIT
REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT
ABB Environmental Services, Inc.

APPENDIX C

foot long by 80 to 100 foot wide corridor trending roughly north-south through the study area.

Anomalies displaying the highest relative amplitudes are located in the northern portion of Area 1. These anomalies encompass a roughly 80 by 120 foot area centered about the Line 160, Position 420. Anomalies in this portion of Area 1 are coincident with the location of what appears to be an asymmetrically-shaped burning ground pit (characterized by a dark area haloed by a light photo-toned area) in 1949 aerial photographs of the site. Anomalies at this location also correspond to the location of a prominent radar anomaly (RA-1) found approximately 2 to 3 feet below ground surface (bgs).

Other magnetic anomalies detected throughout Area 1 correspond to ground scar and the location of past landfilling activities observed in aerial photographs. The relative amplitudes of magnetic anomalies found throughout the central and southern portions of Area 1 are also indicative of significant amounts of buried ferrous materials.

The remainder of the site (Area 2) appears to have no significant magnetic anomalies. Even though portions of the area were found to have a steel cable fence, crushed powder drums, and steel/aluminum electrical cable on the surface, these metals did not appear to have an adverse effect on the resolution of buried metallic objects. Therefore, based on these data and field observations, magnetic anomalies detected in this area are interpreted to be a result of surficial metallic objects.

For the GPR survey a GSSI SIR System III GPR unit with a 500 MHz antenna was used for profiling within the pre-established 260 by 600 foot grid. Based on magnetometer survey results, GPR profiles were made perpendicular to the long axis of the area defined by the magnetometer survey (Figure C-13). A total of 26 GPR traverses were made in a roughly 120 by 500 foot area. Analog strip chart recordings were analyzed and interpreted in the field.

Based on the results of the magnetometer survey, Area 1 was chosen for further study using GPR. A total of seven radar anomalies or anomalous areas (labeled as RA-#) were identified and are outlined in Figure C-14. Table C-4 provides a listing of each identified anomaly; its observed characteristics and relationship to magnetic anomalies. RA-1 is the strongest reflector (2 to 3 feet bgs) encountered during the GPR survey and corresponds directly to the area where the largest magnetic anomalies are observed. The signature of this anomaly is consistent with a significant amount of buried ferrous materials and may be indicative of a large tank or buried drums and/or other metallic objects. Other shallow anomalies displaying strong reflective characteristics include RA-3, 4, 6, and 7. The

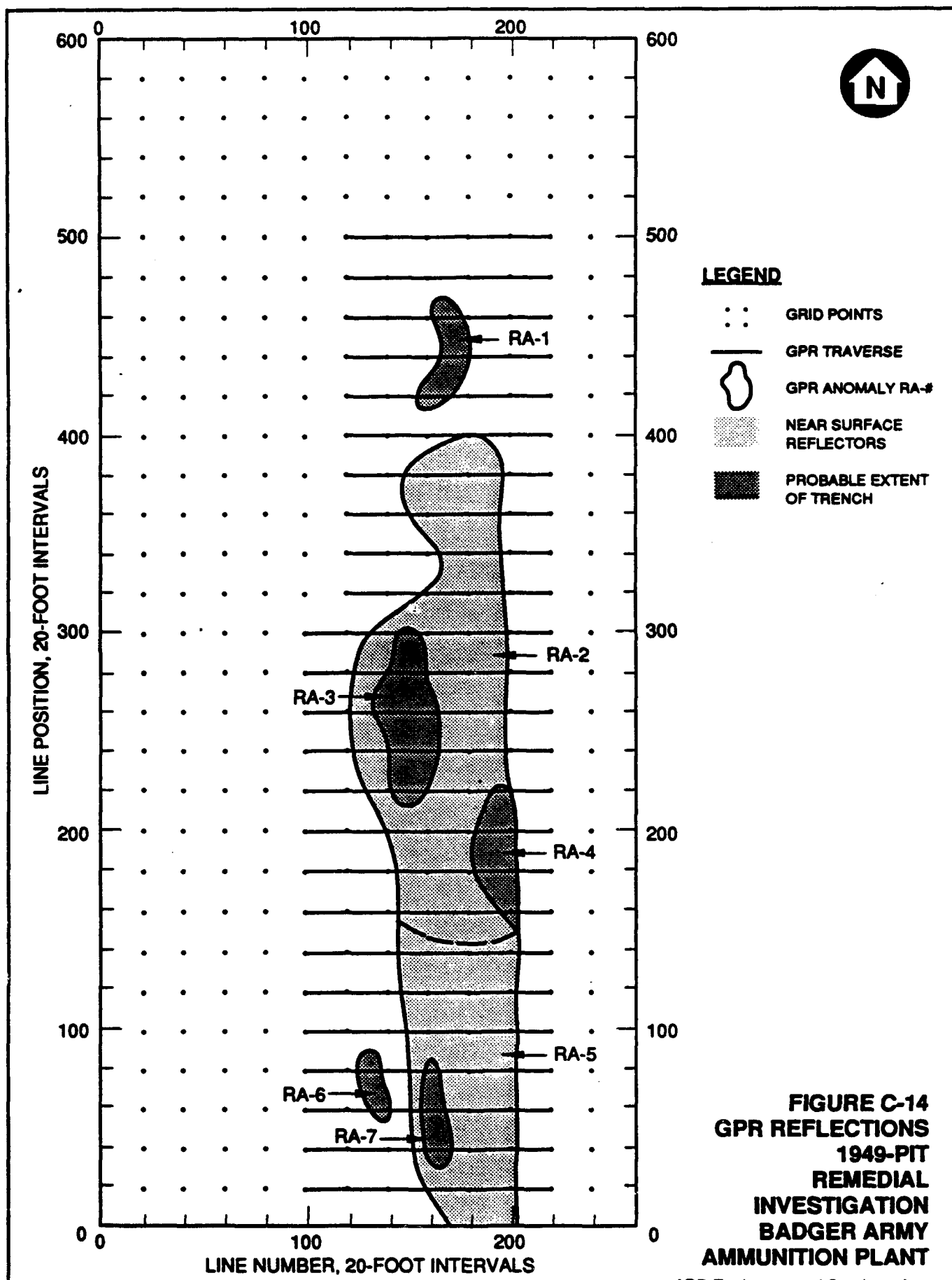


TABLE C-4
GROUND-PENETRATING RADAR ANOMALY CHARACTERISTICS

REMEDIAL INVESTIGATION
BADGER ARMY AMMUNITION PLANT

RADAR ANOMALY	CORRESPONDENCE TO MAGNETIC ANOMALY	CHARACTERISTICS OF ANOMALIES/ANOMALOUS AREAS	INTERPRETATION
RA-1	Yes	Strong, narrow (≤ 10 ft.), continuous reflector, 2-3 feet bgs	Possible buried drum area and/or high concentration of various metallic objects
RA-2	Yes	Relatively weak, broad (20-80 ft.) discontinuous reflectors, extending 3-5 feet bgs	Trench/pit area with moderate concentrations of various metallic objects
RA-3	Yes	Strong, relatively broad (≤ 30 ft.) continuous reflector, extending 1-3 feet bgs	Trench/pit area containing high concentrations of various metallic objects
RA-4	Yes	Strong, fairly narrow (≤ 20 ft.) continuous reflectors, 1-2 feet bgs	Trench/pit area containing high concentrations of various metallic objects
RA-5	Yes	Moderately strong, broad (60 ft.) discontinuous reflectors, extending 3-5 feet bgs	Trench/pit area containing high concentrations of various metallic objects
RA-6	NO	Strong, narrow (≤ 10 ft.) continuous reflector, 1-2 feet bgs	May correspond to area of concrete at surface
RA-7	Yes	Strong, narrow (≤ 10) continuous reflector, 1-2 feet bgs	Corresponds to area of concrete with wire mesh at surface

signature of these anomalies is indicative of buried concrete with wire mesh or rebar. This observation is consistent with the surficial presence of these materials in the vicinity of RA-7.

The remaining anomalous areas, RA-2 and RA-5 (3 to 5+ feet deep), coincide with the location of former possible landfilling activities. However, it should be noted that the radar signature between these anomalies is slightly different. RA-2 is characterized by weak, discontinuous reflectors whereas, RA-5 is characterized by moderately strong, discontinuous reflectors. This may reflect a change in the types of waste contained in each area, suggesting there may be a grater concentration of metals at RA-5. However, the difference between FA-2 and FA-5 may be a function of geologic conditions such as soils having a greater silt content. According to these data, the 1949 Pit area is approximately 400 feet long and 20 to 80 feet wide.

Conclusions and Recommendations. As a result of the magnetometer and GPR surveys, the following general conclusions can be made:

- Magnetic anomalies in Area 1 are interpreted to be the result of substantial amounts of buried metallic objects found within a 500 foot long by 80 to 100 foot wide corridor trending north-south through the study area. Area 1 radar anomalies suggest waste may extend deeper than three feet bgs.
- Wastes buried in Area 1 may include concrete with rebar, buried drums and building demolition debris.
- Area 2 shows no significant magnetic anomalies suggesting that no considerable amounts of buried metallic materials or debris exist in this area.

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APPENDIX D
DRILLING AND SOIL SAMPLING PROGRAM

- D.1 Test Pit, Soil Boring, and Monitoring Wells Boring Logs**
- D.2 Field Data Records - Soil, Sediments, and Surface Water**
- D.3 Monitoring Well Construction Diagrams**
- D.4 Well Development Records**
- D.5 Regional Water Supply Well Logs**

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Appendix D.1

Test Pit, Soil Boring, and Monitoring Wells Boring Logs

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TEST PIT LOGS

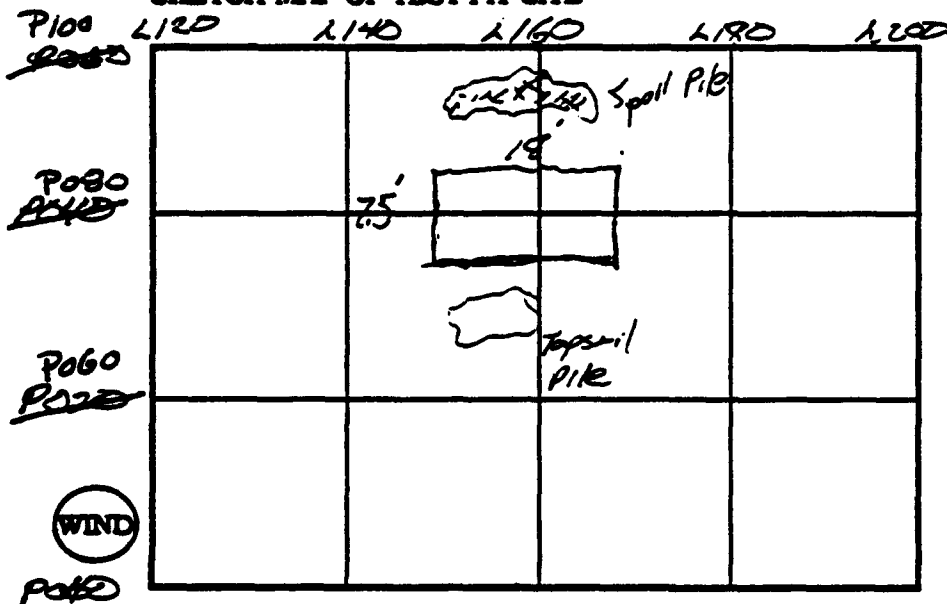
Boring Description	Contractor	Date Installed
Propellant Burning Ground		
PBT-90-01	ABB-ES	9/5/90
PBT-90-02	ABB-ES	9/5/90
PBT-90-03	ABB-ES	9/5/90
PBT-90-04	ABB-ES	9/5/90
PBT-90-05	ABB-ES	9/5/90
PBT-90-06	ABB-ES	9/6/90
PBT-90-07	ABB-ES	9/6/90
PBT-90-08	ABB-ES	9/6/90

BAAP TEST PIT RECORD

1 of 2

SITE Boydell + Boring Ground
 TEST PIT PBT-90-01 DATE 9/5/90 TIME 0830 END _____
 COORDINATES 1150 0180 GRID ELEMENT 20 9.11.14

SKETCH MAP OF TEST PIT SITE



SCALE 1" = 20 FT.

NOTES: Test pits are located
according to existing
geophysical survey grid.
Dimensions of TP-1 are
75' wide, 18' long and 13'
deep.

CREW MEMBERS:

1. J. Calton
2. D. Dunning
3. J. Buss
- 4.
- 5.
- 6.

MONITOR EQUIPMENT:

PI Meter ☒ N
 Explosive Gas ☒ N
 Avail. Oxygen Y N
 OVA Y N
 Other _____

Photographs, Roll 1 ABB/E.J.

Exposure 1, 2

Photographs Roll 1 DSD

Exposures # 8, 9

1, 2, 3, 3
Photos 1, 2, 3, 4-5.

E.C.JORDAN CO.

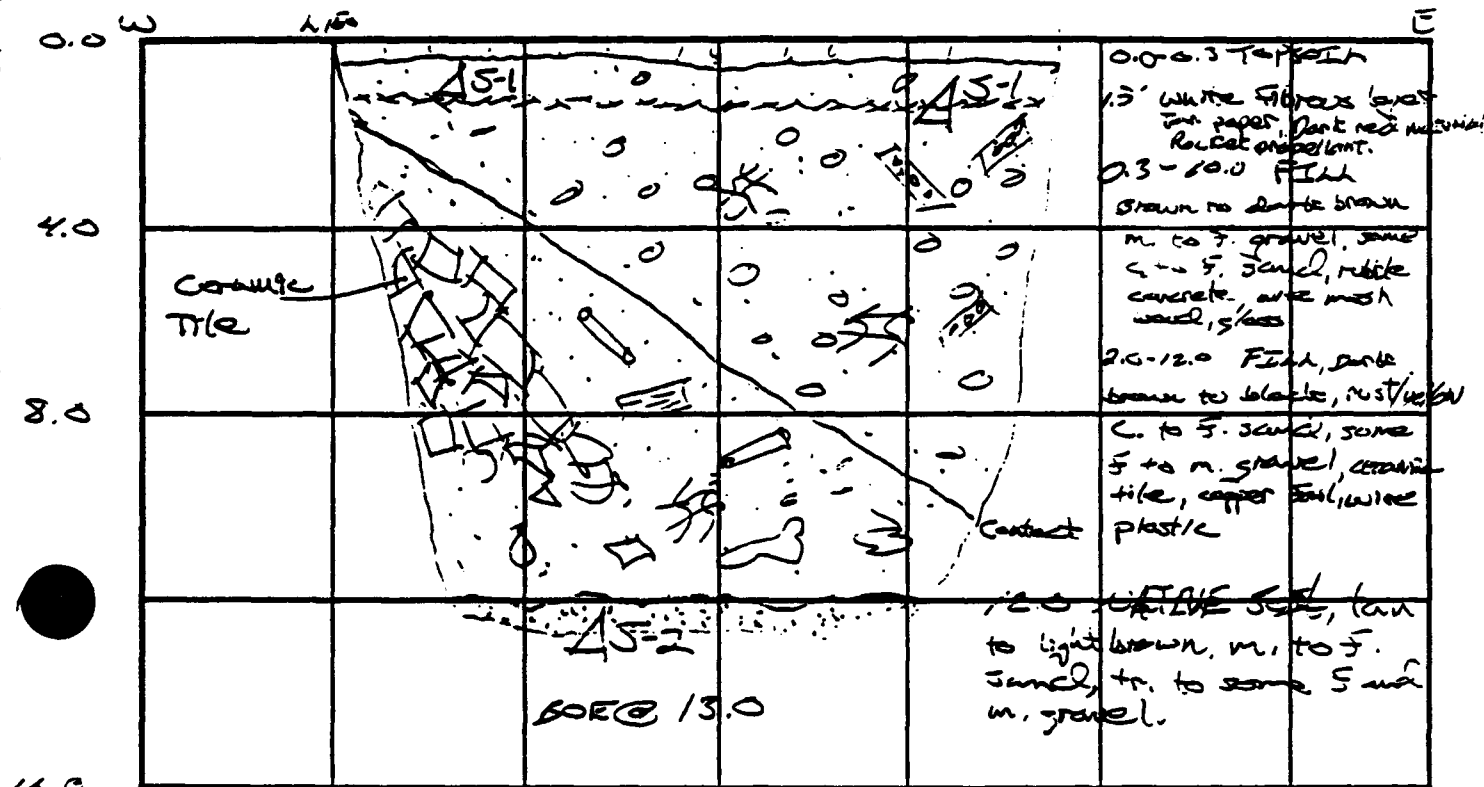
BAAP TEST PIT RECORD

2 of 2

Profile Along Test Pit- PBT-90-01

SITE Propellant Binning Ground

SKETCH MAP OF TEST PIT PROFILE



SCALE 1" = 5 FT.
DEPTH (FT.)

NOTES: TP-1 DIM (7.5 x 18 x 15)

- * AS-1 is a composite sample consisting of white fibrous material and dark red material (indicative of rocket parts) given collect sample to analyze.
- * AS-2 is a grab/composite sample consisting of lignite soil, tan to light brown,

SAMPLES OBTAINED:

No.	Depth (FT.)	Int. Ser. No.	HD. SP. VOA PPM
S-1	1.0	TP90001	BKG
S-2	12.0-13.0	TP90012	BKG
S-3			
S-4			
S-5			
S-6			
S-7			
S-8			

REFERENCE: Field Book, Pg. _____

Attachments _____

SIGNATURE: _____

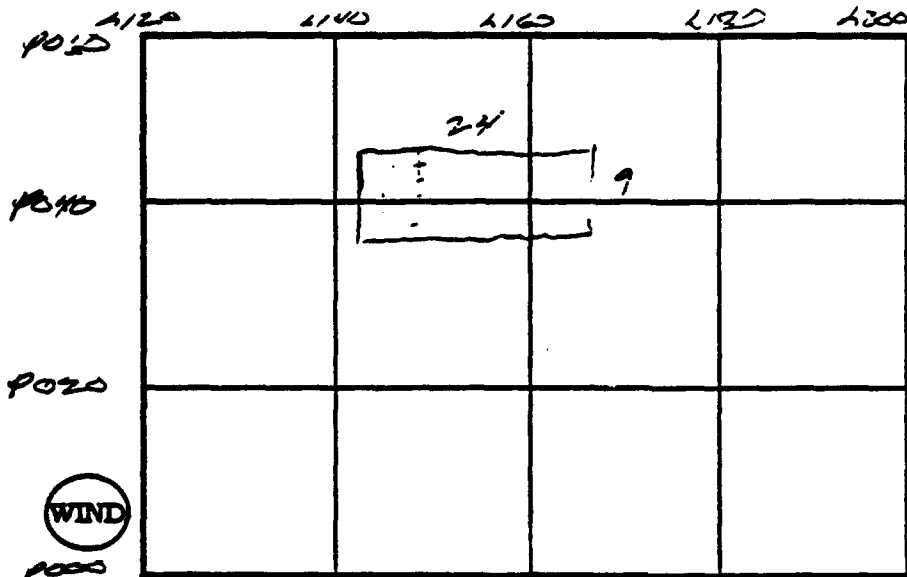
E.C.JORDAN CO.

HAAP TEST PIT RECORD

1 of 2

SITE Propellant Storage Area
 TEST PIT PA PBT-90-02 DATE 5-1-82 TIME _____ END _____
 COORDINATES _____ GRID ELEMENT _____

SKETCH MAP OF TEST PIT SITE



SCALE 1" = 20 FT.

NOTES: Soil sample T9002003 taken @ 3 ft.
 Mixture of flaky brick-colored material
 and fill that was adjacent to this
 No second sample taken - native soil @ 4 ft

CREW MEMBERS:

1. S. Callem
2. D. Durling
3. J. Buss
- 4.
- 5.
- 6.

MONITOR EQUIPMENT:

PI Meter ☒ N
 Explosive Gas ☒ N
 Avail. Oxygen ☒ N
 OVA ☒ Y N
 Other _____

Photographs, Roll _____

Exposure _____

Photo DBD 1 1/2 ft depth
 red material #10, #11
 3 ft depth #11
 Photo ECS 1 1/2 ft
 red material depth
 #4 or 5 - 7?
 #7 3 ft depth
 #9, 10 down to native soil
 Photos 6 to 12.

E.C. JORDAN CO.

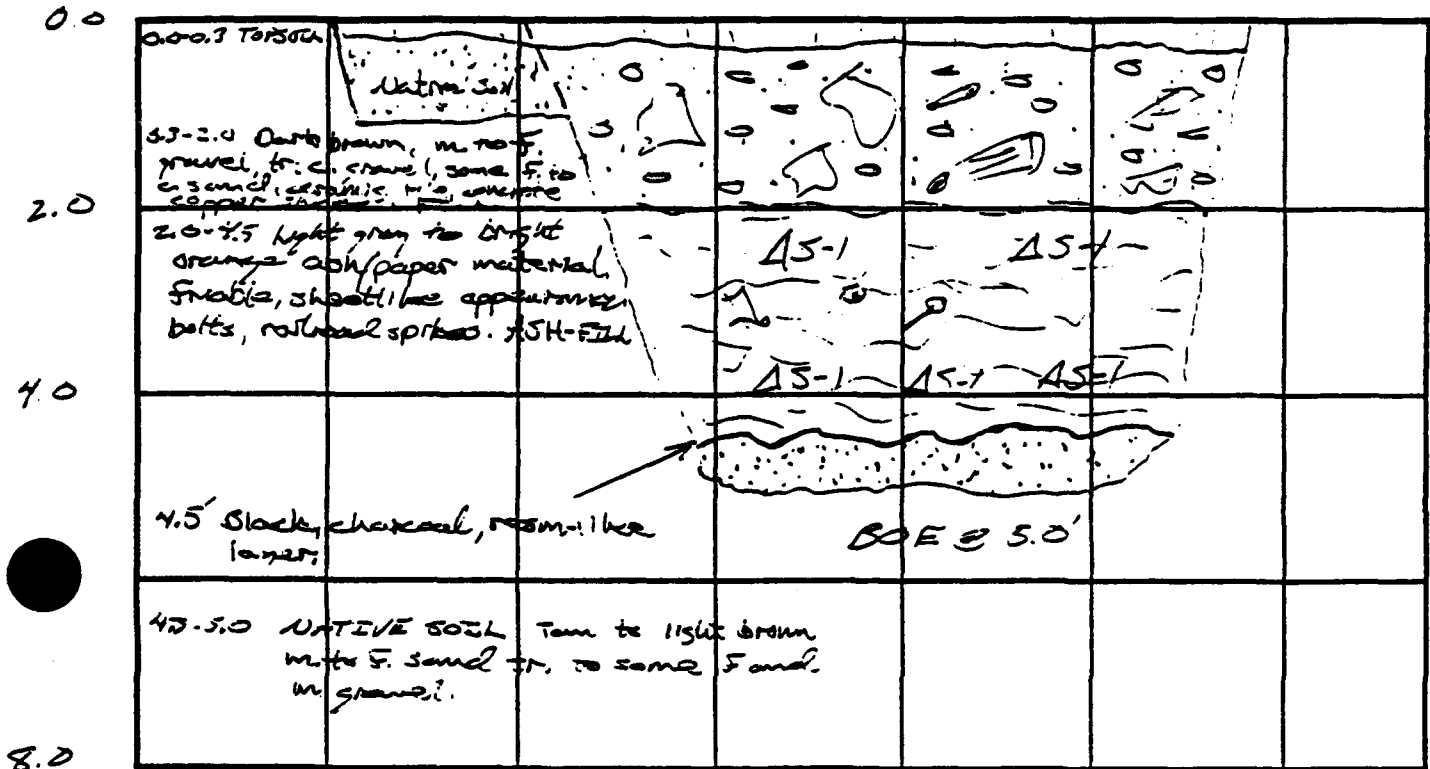
BAAP TEST PIT RECORD

2 of 2

Profile Along Test Pit- M PBT-90-02

SITE Propellant Burning Ground

SKETCH MAP OF TEST PIT PROFILE



SCALE 1" = 5 FT.

DEPTH (FT.)

NOTES: TP-2 DIA (9 x 24 x 5)

S-1 is a composite sample taken between 2.0-4.5' consisting of sediment and ash/paper materials

SAMPLES OBTAINED:

No.	Depth (Ft.)	Int. Ser. No.	HD. SP. VOA PPM
S-1	3.0	19902023	806
S-2			
S-3			
S-4			
S-5			
S-6			
S-7			
S-8			

REFERENCE: Field Book, Pg. _____

Attachments _____

SIGNATURE: _____

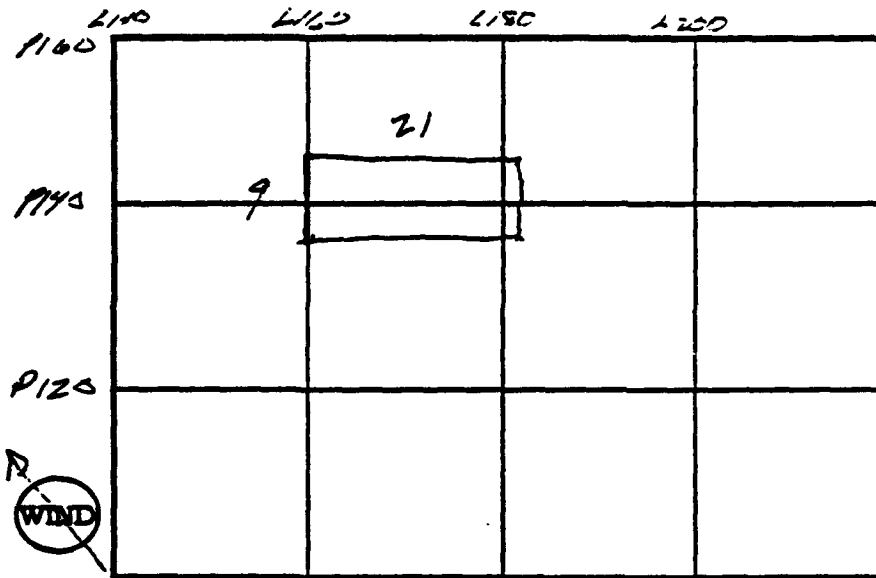
E.C.JORDAN CO.

BAAP TEST PIT RECORD

1 of 2

SITE Point 1st Runway Road
 TEST PIT PST-00-03 DATE 9-5-50 TIME 11:45 END _____
 COORDINATES _____ GRID ELEMENT _____

SKETCH MAP OF TEST PIT SITE



SCALE 1" = _____ FT.

NOTES: Sample 3 T9003005 taken below white layer in greyish layer beneath to assess effect of white layer

Sample T9003009 taken from bucket, composite sample lot of metal anomalies betw 6 ft & depth of at least 9

Sample T9003012 taken from bucket & spoils sample. Composite sample. Blue, yellow, black moist clayey material

TF-3 Dim (9 x 21 x 16)

CREW MEMBERS:

1. J. Buss
2. D. Calkin
3. D. Durling
- 4.
- 5.
- 6.

MONITOR EQUIPMENT:

PI Meter	Y	N
Explosive Gas	Y	N
Avail. Oxygen	Y	N
OVA	Y	N
Other		

Photographs, Roll _____

Exposure _____

Photo CCT
 #12 & 13, rebar & white & red material ≈ 3 ft w/ backhoe bucket
 #14 picture w/ anomaly
 #15, 16, 17 colorful, clay material
 #18- DBD photos depth of pit 16 ft
 #12, 13, 14 colorful stuff
 #15, 16 multicolored rock depth of pit 16 ft

E.C. JORDAN CO.

photos 13 to 22

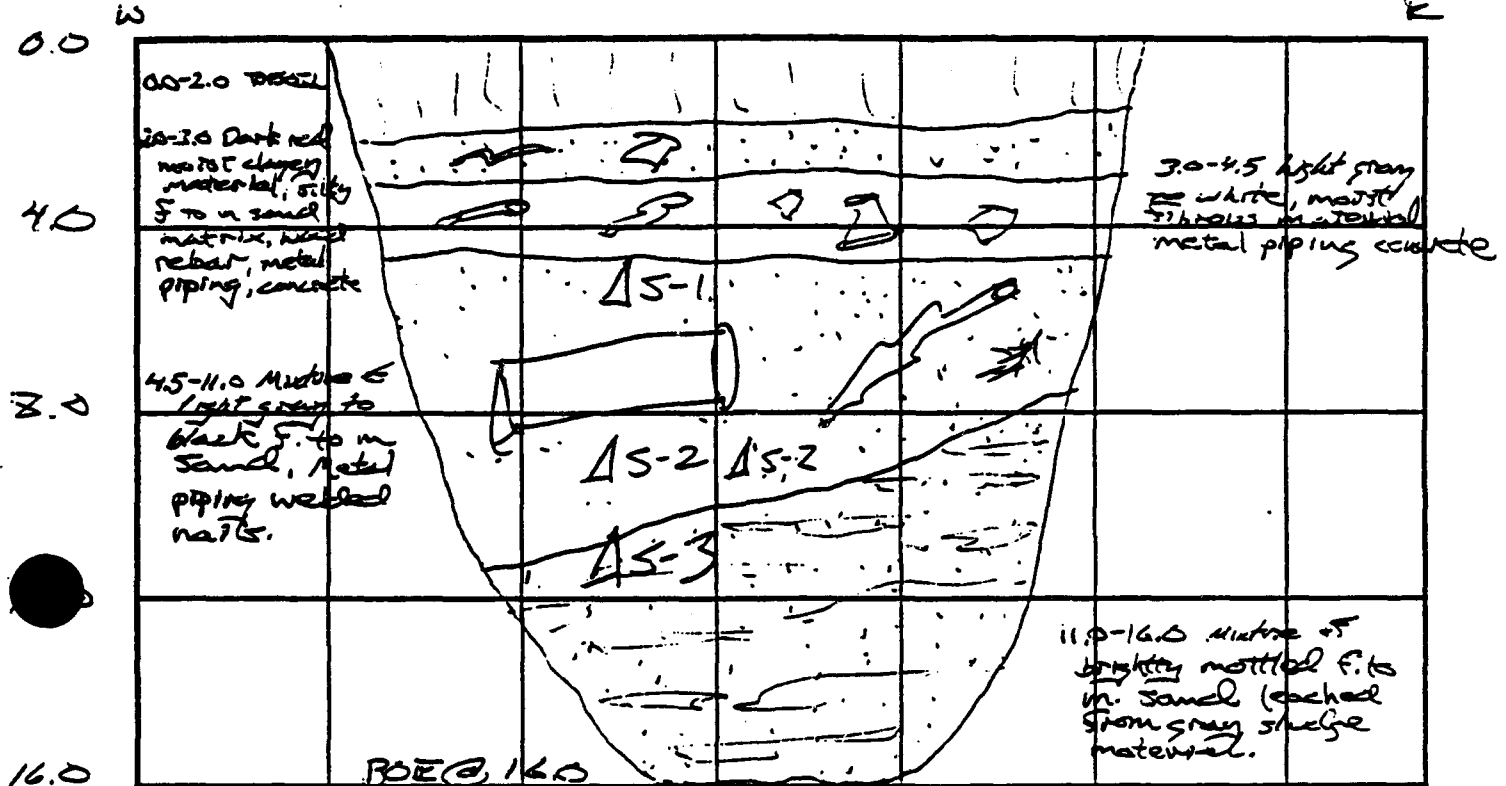
BAAP TEST PIT RECORD

2 of 2

Profile Along Test Pit- PLBT-90-03

SITE Prophet Burning Ground

SKETCH MAP OF TEST PIT PROFILE



SCALE 1" = 5 FT.
DEPTH (FT.)

NOTES: TP-3 core (9 x 21 x 12)

- * S-1 is a discrete sample, consist of light gray silt to medium sand.
- * S-2 is a composite grab sample
- * S-3 is a composite grab sample consists of brightly colored, mottled silt to medium sand.

SAMPLES OBTAINED:

No.	Depth (Ft.)	Int. Ser. No.	HD. SP. VOA PPM
S-1	5.0	T9005005	BKG
S-2	9.0	T9003009	BKG
S-3	11.0	T9003011	BKS
S-4			
S-5			
S-6			
S-7			
S-8			

REFERENCE: Field Book. Pg. _____

Attachments _____

SIGNATURE: _____

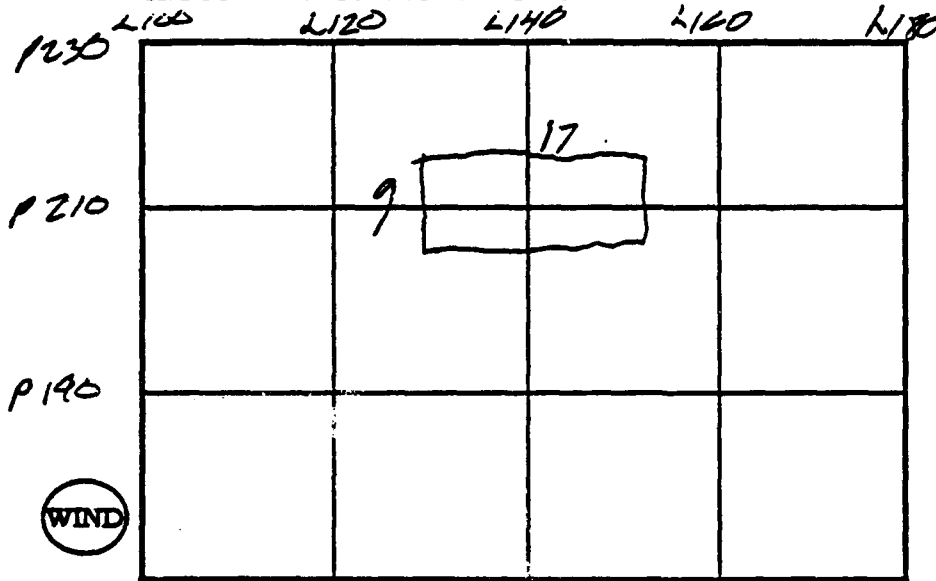
E.C.JORDAN CO.

BAAP TEST PIT RECORD

1 of 2

SITE Propellant Burning Ground
 TEST PIT # PBT-90-04 DATE 9/5/80 TIME 1515 END _____
 COORDINATES _____ GRID ELEMENT _____

SKETCH MAP OF TEST PIT SITE



SCALE 1" = 20 FT.

NOTES: TP-7 Dim (9x17x8)

CREW MEMBERS:

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

MONITOR EQUIPMENT:

PI Meter ☒ Y N
 Explosive Gas ☒ Y N
 Avail. Oxygen ☒ Y N
 OVA ☒ Y N
 Other _____

Photographs. Roll _____

Exposure _____

Photo 23

E.C.JORDAN CO.

BAAP TEST PIT RECORD

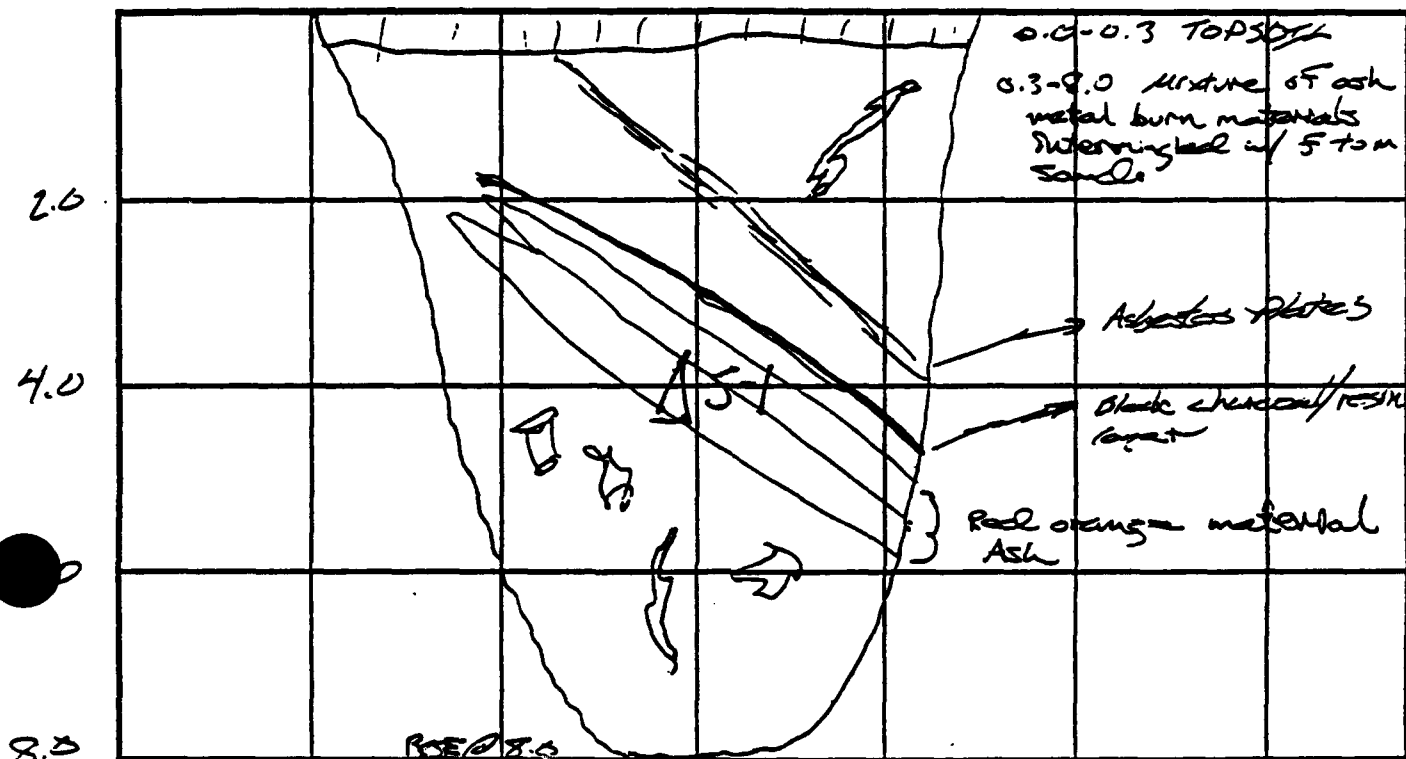
2 of 2

Profile Along Test Pit-

PBT-90-04

SITE Propellant Burning Ground

SKETCH MAP OF TEST PIT PROFILE



SCALE 1" = 5 FT.
DEPTH (FT.)

NOTES:

* S-1 is a composite sample consisting of red/orange material and fill material

SAMPLES OBTAINED:

No.	Depth (Ft.)	Int. Ser. No.	HD. SP. VOA PPM
S-1	7.0	1700000	0.16
S-2			
S-3			
S-4			
S-5			
S-6			
S-7			
S-8			

REFERENCE: Field Book, Pg. _____

Attachments _____

SIGNATURE: _____

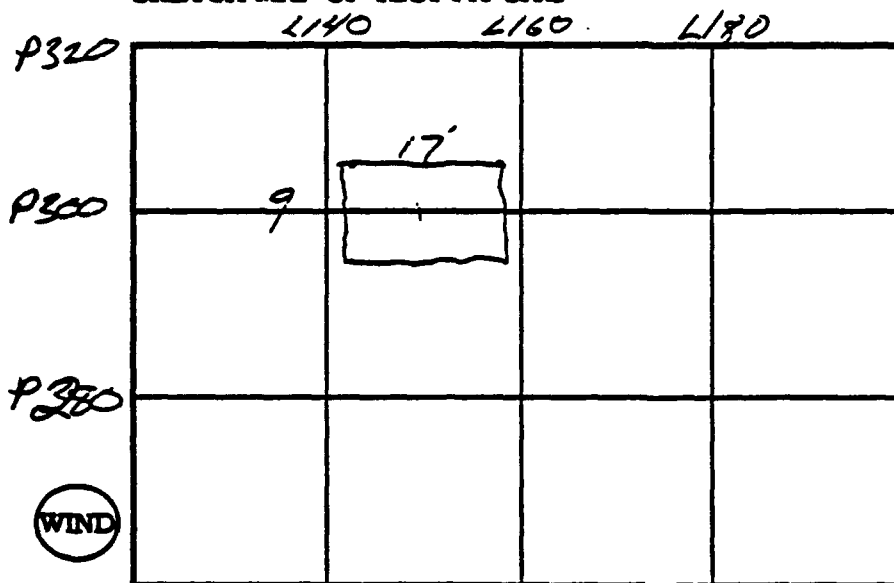
E.C.JORDAN CO.

BAAP TEST PIT RECORD

1 of 2

SITE Propellant Bunkers, Ground
 TEST PIT BT PBT-90-05 DATE 9/5/50 TIME _____ END _____
 COORDINATES _____ GRID ELEMENT _____

SKETCH MAP OF TEST PIT SITE



SCALE 1" = 20 FT.

NOTES: TP-5 location tied to existing
TP-5 dim (9 x 17 x 85)

CREW MEMBERS:

1. S. Carlson
2. J. Buss
3. D. Outing
4. _____
5. _____
6. _____

MONITOR EQUIPMENT:

PI Meter Y N
 Explosive Gas Y N
 Avail. Oxygen Y N
 OVA Y N
 Other _____

Photographs, Roll _____

Exposure _____

Photos 24+25

E.C.JORDAN CO.

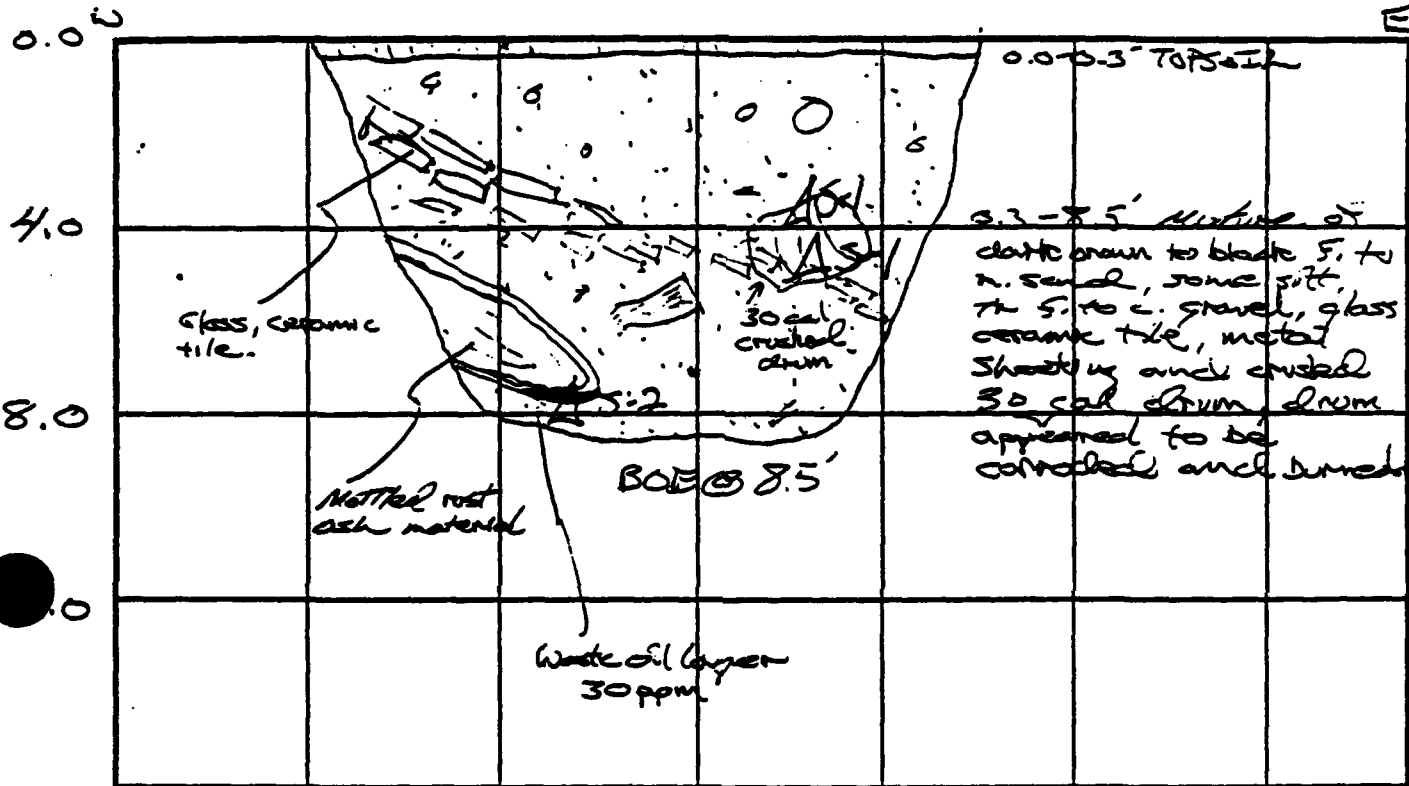
BAAP TEST PIT RECORD

2 of 2

Profile Along Test Pit- at PBT-90-05

SITE Impacted Burning Ground "1999 pit"

SKETCH MAP OF TEST PIT PROFILE



SCALE 1" = 5 FT.
DEPTH (FT.)

NOTES:

Sample #1 taken ~~at~~ from soil that remained on drum after it was pulled out "decrete"

Sample #2 was a composite sample of a layered material including an alleged waste oil layer that registered 30ppm on the ovm. It smelled like waste oil.

Pictures ECT

SAMPLES OBTAINED:

No.	Depth (Ft.)	Int. Ser. No.	HD. SP. VOA PPM
S-1	4.0 3.0	079005208	0
S-2	8.0	79005008	30ppm
S-3			
S-4			
S-5			
S-6			
S-7			
S-8			

REFERENCE: Field Book, Pg. _____

Attachments _____

SIGNATURE: _____

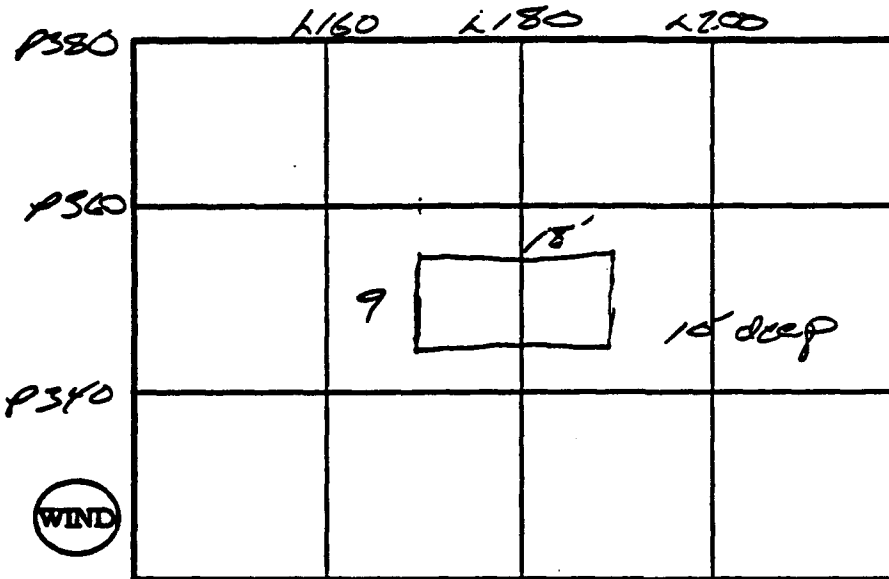
E.C.JORDAN CO.

HAAP TEST PIT RECORD

1 of 2

SITE Propellant Staging Ground
 TEST PIT # PST-90-06 DATE 7/6/90 TIME 0815 END 0945
 COORDINATES _____ GRID ELEMENT _____

SKETCH MAP OF TEST PIT SITE



SCALE 1" = 20 FT.

NOTES: TP-6 is located according to
the existing geophysical survey
grid.
TP-6 Dim (9 x 18 x 10)

CREW MEMBERS:

1. S. Calkins
2. D. Duffney
3. T. Buss
4. _____
5. _____
6. _____

MONITOR EQUIPMENT:

PI Meter ☒ Y N
 Explosive Gas ☒ Y N
 Avail. Oxygen ☒ Y N
 OVA ☒ Y N
 Other _____

Photographs, Roll _____

Exposure _____

photos 28 + 29

E.C.JORDAN CO.

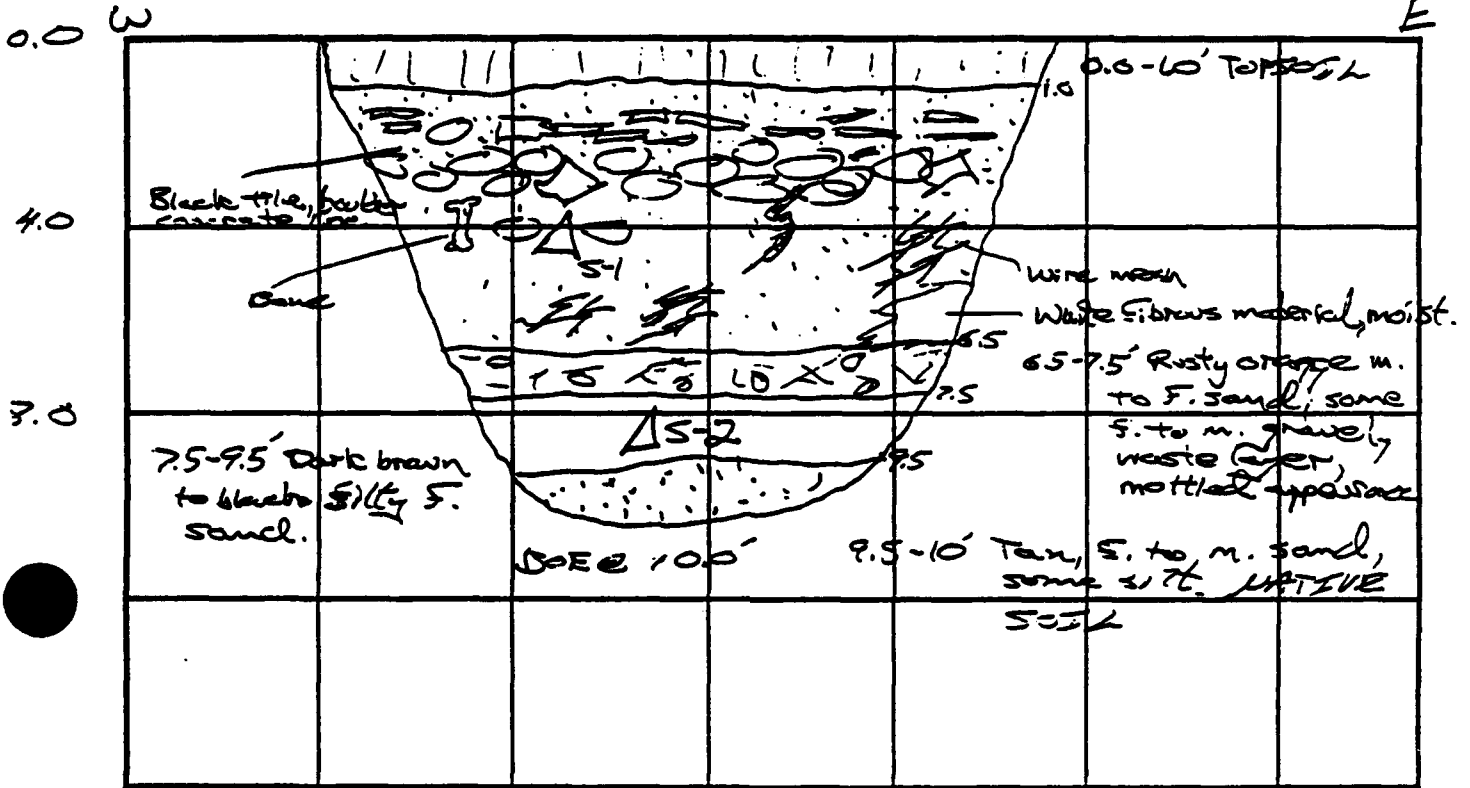
BAAP TEST PIT RECORD

2 of 2

Profile Along Test Pit- PRT-90-06

SITE Propellant Burning Ground "1949 pit"

SKETCH MAP OF TEST PIT PROFILE



SCALE 1" = 5 FT.
DEPTH (FT.)

NOTES:

Sample 1 taken at 3 ft. May reflect a general waste type in this area, OUM level 5 ppm

Sample 2 taken at 9 ft. Also to reflect general waste. Native soil at 10 ft

Pictures CJS 27, 28(?)

SAMPLES OBTAINED:

No.	Depth (Ft.)	Int. Ser. No.	HD. SP. VOA PPM
S-1	3.0	77006013	5
S-2	9.0	77006109	0
S-3			
S-4			
S-5			
S-6			
S-7			
S-8			

REFERENCE: Field Book, Pg. _____

Attachments _____

SIGNATURE: _____

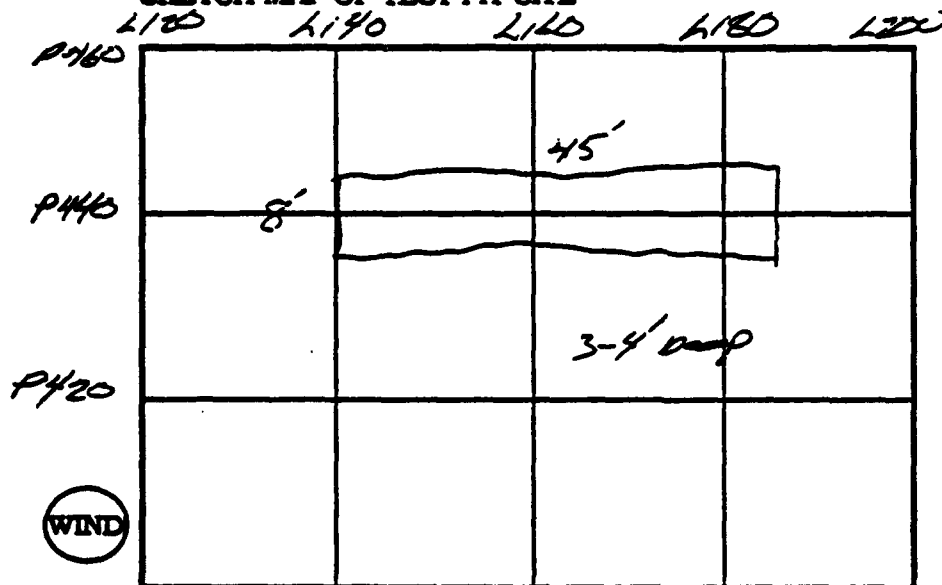
E.C.JORDAN CO.

BAAP TEST PIT RECORD

1 of 1

SITE Popelant Building Ground
 TEST PIT PR DBT-90-07 DATE 9/6/90 TIME 1000 END 1115
 COORDINATES _____ GRID ELEMENT _____

SKETCH MAP OF TEST PIT SITE



SCALE 1" = 20 FT.

NOTES: TP-7 location tied to
existing geophysical survey
and
TP-7 area (8 x 45 x 3-4)

CREW MEMBERS:

1. D. Darling
2. J. Bass
3. S. Calkin
4. _____
5. _____
6. _____

MONITOR EQUIPMENT:

PI Meter (Y) N
 Explosive Gas Y N
 Avail. Oxygen (Y) N
 OVA Y N
 Other _____

Photographs. Roll _____

Exposure _____

Photos 30-34

E.C.JORDAN CO.

BAAP TEST PIT RECORD

2 of 2

Profile Along Test Pit- PR-90-07

SITE Propellant Burning Ground

SKETCH MAP OF TEST PIT PROFILE



SCALE 1" = 10 FT.
DEPTH (FT.)

NOTES: _____

* S-1 is a discrete sample of a dark charcoal/ash layer

* S-2 is a discrete sample of tan, S. to m. sand

SAMPLES OBTAINED:

No.	Depth (Ft.)	Int. Ser. No.	HD. SP. VOA PPM
S-1	3.0	TR007003	BKG
S-2	4.0	TR007004	BKG
S-3			
S-4			
S-5			
S-6			
S-7			
S-8			

REFERENCE: Field Book, Pg. _____

Attachments _____

SIGNATURE: _____

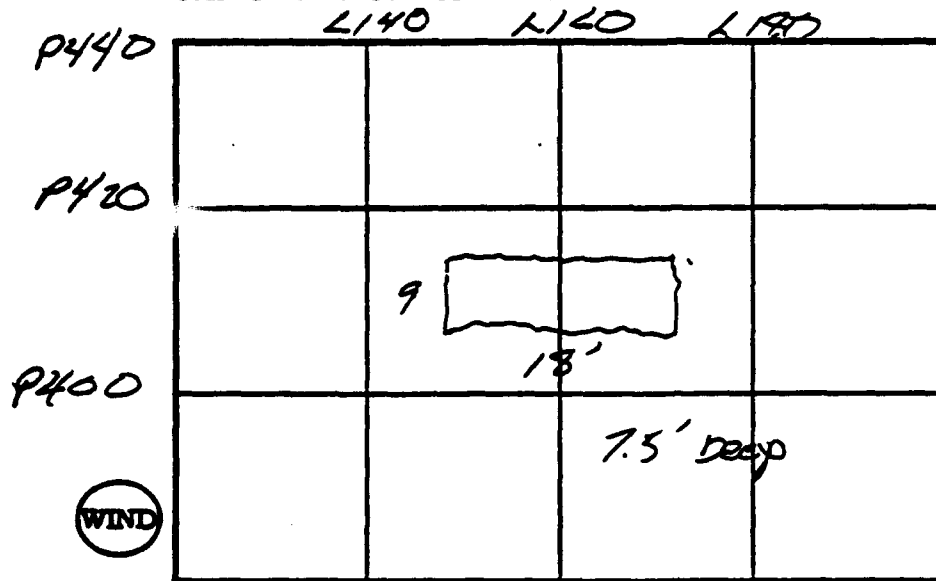
E.C.JORDAN CO.

HAAP TEST PIT RECORD

1 of 1

SITE Exellent Bunking Ground
 TEST PIT TP-8 DATE 9/6/90 TIME _____ END _____
 COORDINATES _____ GRID ELEMENT _____

SKETCH MAP OF TEST PIT SITE



SCALE 1" = 20 FT.

NOTES: TP-8 located according to
existing geographical survey
grid.
TP-8 dim (9 x 18 x 7.5)

CREW MEMBERS:

1. S. Calton
2. T. Buss
3. D. D. Harg
4. _____
5. _____
6. _____

MONITOR EQUIPMENT:

PI Meter ☒ Y N
 Explosive Gas ☒ Y N
 Avail. Oxygen ☒ Y N
 OVA ☒ Y N
 Other _____

Photographs, Roll _____

Exposure _____

Photos

E.C.JORDAN CO.

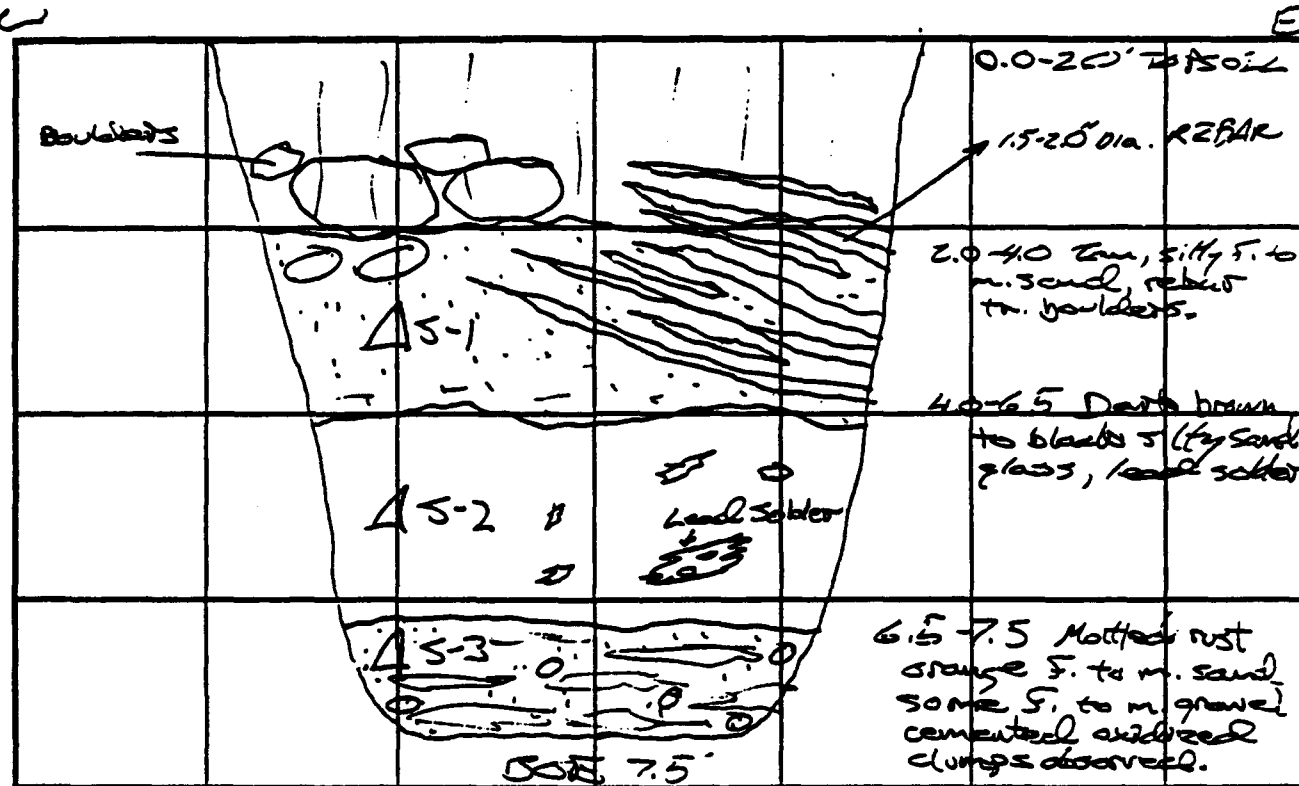
HAAP TEST PIT RECORD

2 of 2

Profile Along Test Pit- PBT-90-08

SITE Repellant Burning Ground

SKETCH MAP OF TEST PIT PROFILE



SCALE 1" = 5 FT.
DEPTH (FT.)

NOTES:

- * S-1 is a discrete sample consisting of fine, silty f. to m. sand
- * S-2 is a discrete sample consisting of dark brown to black silty sand
- * S-3 is a sand sample consisting of mottled rust/orange cemented f. to m. sand

SAMPLES OBTAINED:

No.	Depth (Ft.)	Int. Ser. No.	HD. SP. VOA PPM
S-1	3.0	7708002	BKG
S-2	5.0	7708003	BKG
S-3	7.0	7708004	BKG
S-4			
S-5			
S-6			
S-7			
S-8			

REFERENCE: Field Book, Pg. _____

Attachments _____

SIGNATURE: _____

E.C.JORDAN CO.

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SEDIMENT LOGS

Boring Description	Contractor	Date Installed
Control Pond		
CP-1	Ayres	6/29/84
CP-2	Ayres	6/28/84
CP-3	Ayres	6/30/84
Ballistics Creek		
BC-1	Ayres	7/3/84
BC-2	Ayres	7/3/84
BC-3	Ayres	7/3/84
BC-4	Ayres	7/3/84
BC-5	Ayres	6/30/84
Ballistics Pond		
BP-1	Ayres	7/1/84
BP-2	Ayres	7/3/84
BP-3	Ayres	7/3/84
BP-4	Ayres	6/30/84
BP-5	Ayres	7/1/84
BP-6	Ayres	6/29/84
BP-7	Ayres	6/30/84
Control Pond		
Spike 1	Ayres	7/3/84
Spike 2	Ayres	7/3/84
Spike 3	Ayres	7/3/84
Spike 4	Ayres	7/3/84
Spike 5	Ayres	7/3/84
Spike 6	Ayres	7/3/84
Spike 7	Ayres	7/3/84
Spike 8	Ayres	7/3/84
Final Creek		
FC-1	Ayres	6/29/84
FC-2	Ayres	7/1/84
FC-3	Ayres	6/29/84
FC-4	Ayres	7/1/84

FC-5	Ayres	6/29/84
FC-6	Ayres	6/30/84
FC-7	Ayres	6/29/84
FC-8	Ayres	7/1/84

Final Pond 1

FPI-1	Ayres	7/1/84
FPI-2	Ayres	7/2/84
FPI-3	Ayres	7/1/84
FPI-4	Ayres	7/3/84
FPI-5	Ayres	7/2/84
FPI-6	Ayres	7/1/84
FPI-7	Ayres	7/1/84
FPI-8	Ayres	7/1/84
FPI-9	Ayres	7/1/84
FPI-10	Ayres	7/2/84
FPI-11	Ayres	6/29/84
FPI-12	Ayres	6/29/84
FPI-13	Ayres	6/29/84
FPI-14	Ayres	7/1/84

Final Pond 2

FPII-1	Ayres	6/30/84
FPII-2	Ayres	7/2/84
FPII-3	Ayres	7/2/84

Final Pond 3

FPIII-1	Ayres	6/28/84
FPIII-2	Ayres	6/28/84
FPIII-3	Ayres	6/30/84
FPIII-4	Ayres	6/29/84
FPIII-5	Ayres	6/28/84
FPIII-6	Ayres	6/28/84
FPIII-7	Ayres	6/29/84
FPIII-8	Ayres	6/28/84
FPIII-9	Ayres	6/29/84
FPIII-10	Ayres	6/29/84
FPIII-11	Ayres	6/30/84
FPIII-12	Ayres	6/30/84
FPIII-13	Ayres	6/28/84
FPIII-14	Ayres	6/28/84
FPIII-15	Ayres	6/28/84

Final Pond 4

FPIV-1	Ayres	6/29/84
FPIV-2	Ayres	6/30/84
FPIV-3	Ayres	7/1/84
FPIV-4	Ayres	7/1/84
FPIV-5	Ayres	7/1/84
FPIV-6	Ayres	6/30/84
FPIV-7	Ayres	7/1/84
FPIV-8	Ayres	6/30/84
FPIV-9	Ayres	7/1/84
FPIV-10	Ayres	6/28/84

Nitroglycerine Pond

NG-1	Ayres	7/1/84
NG-2	Ayres	6/30/84
NG-3	Ayres	6/30/84
NG-4	Ayres	6/30/84
NG-5	Ayres	6/28/85
NG-6	Ayres	6/30/84
NG-7	Ayres	6/30/84
NG-8	Ayres	6/30/84

Oleum Pond

OP-1	Ayres	6/27/84
OP-2	Ayres	6/27/84
OP-3	Ayres	7/2/84
OP-4	Ayres	7/1/84
OP-5	Ayres	7/1/84
OP-6	Ayres	6/26/84
OP-7	Ayres	6/28/84
OP-8	Ayres	7/2/84
OP-9	Ayres	6/27/84

Rocket Area

RAD-1	Ayres	7/2/84
RAD-2	Ayres	7/3/84
RAD-3	Ayres	7/2/84
RAD-4	Ayres	7/2/84
RAD-5	Ayres	7/2/84
RAD-6	Ayres	7/2/84
RAD-7	Ayres	7/3/84
RAD-8	Ayres	7/3/84

RAD-9	Ayres	7/2/84
RAD-10	Ayres	7/2/84
RAD-11	Ayres	7/2/84
RAD-12	Ayres	7/2/84
RAD-13	Ayres	7/2/84
RAD-14	Ayres	7/2/84
RAD-15	Ayres	7/2/84
RAD-16	Ayres	7/2/84
RAD-17	Ayres	7/2/84
RAD-18	Ayres	6/30/84
RAD-19	Ayres	7/1/84
RAD-20	Ayres	6/30/84

AYRES
ASSOCIATES

PROJECT NAME: Glin Eco/ENV DATE: 6/29/94 PROJECT NO.: 3408.00
SAMPLE LOCATION: Central Pond LOGGED BY: WEG SAMPLE NO.: CP-1

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0 - 12"	SM	Photo IA 25 Brn w/ blk streaks & mottles. Silty, fine sand. A few silty laminations in bottom 2" of zone. 5YR3/2 fine roots. thru zone.
12" - 31"	SP	med. to light brown fine sand, w/ brn. mottles throughout. Bottom 2" has chunk of blk. fine-sandy silt. 10YR6/6 Perm sample 0"-6".

TEST RESULTS

[illegible]

AYRES
ASSOCIATES
SAMPLE LOG

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 6/30/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Central Pond LOGGED BY: WFB SAMPLE NO.: CP-3

DESCRIPTION

SAMPLE LOCATION: C-2011-01-1		
DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-9"	OL	Photo IB3 Saturated olv. brn organic muck. SY 2.5/2
9"-14"	SP	gry-grn uniform fine sand w/ few dark mottles. Wet but not sat. SY 4/2
14"-22"	CH	Dk. olive clay, mod. to highly plastic. Soft SY 2.5/2
END		
		PERM @ 15"-21"

TEST RESULTS

[illegible]

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AYRES
ASSOCIATES

PROJECT NAME: Olin Eco/ENV DATE: 7/3/84 PROJECT NO.: 3408.00
SAMPLE LOCATION: Ballast Creek LOGGED BY: WEG SAMPLE NO.: BC-1

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-16"	ML	photo ID 3 Brn sandy silt. Top 1" is mostly organic leaf stems, dead grass, etc. held together w/ silt. From 1"-2" is very moist light buff colored silty clay, color 10YR 6/4 (moist) (Dry - white). From 2"-16" is predominant brn color - 5YR 4/4. A black sand patch at 13". Sand increased in bottom 2". Also present is weathered gravel up to 1½" dia.
16"-25"	SP	Brn fn - med sand. 5Y 3/4
<u>End</u>		Perm 18"-23"

TEST RESULTS

[illegible]

AYRES

SAMPLE LOG

PROJECT NAME: Olin Eco/ENV

DATE: 7/3/84

PROJECT NO.: 3408.00

SAMPLE LOCATION: Ballston Creek

LOGGED BY: WFG

SAMPLE NO.: BC-3

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0 - 22"	ML	photo ID 2 Brn silt w/ f. sand. Some mottling & v. thin wavy lenses. Roots @ 5" & 10" ($\frac{1}{8}$ " & $\frac{1}{4}$ " dia.). From 8"-10" is sandy zone. Fine roots @ 20". A 1" sandy zone @ 19". 5Y3/2
22"-25"	SM	Brn & gry med sand & silt. lg. root @ 25" Predominant sand layer at 22". Remainder is med sand & silt mixed. 5YR 3/2
25"-29"	CL	Rusty / olv. brn stiff clay. Some v. thin layering, especially in bottom 2". 5YR 4/6

TEST RESULTS

[illegible]

AYRES
ASSOCIATES
SAMPLE LOG

PROJECT NAME: Olin Eco/ENV DATE: 7/3/84 PROJECT NO.: 3408.00
SAMPLE LOCATION: Ballistics Creek LOGGED BY: WFG SAMPLE NO.: BC-4

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0 - 12"	SP-sm	photo ID 7 gry-brn, wet, silty med. sand w/ abundant leaves, twigs & wood pieces. Organics decrease w/ depth. 5YR 3/2
12"-18"	Sludge	Gry to blk, v. soft, saturated sludge like material. Pudding texture & behavior. 7.5YR 2/0
18"-19"	SP	1" med-co sand, w/ some fine sand. 5YR 3/2
19"-24"	CH	Gry, soft clay w/ some silt. Severely weathered 1" gravel piece @ 23". 7.5YR 3/0
24"-27"	SM	Gry, silty, sand w/ gravel. 7.5YR 4/0
<u>END</u>		

TEST RESULTS

[illegible]

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SAMPLE LOG

SAMPLE NO.: BP-2

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0 - 9"	ML	photo ID 6 Dk. gry - brn silt w/ some clay. Roots through interval. 542.5/1
9' - 22"	CL	Ol/b-brn, very stiff silty clay. Abundant fine black specs. 544/2 Looks like carbon?
<u>END</u>		

TEST RESULTS

[illegible]

SAMPLE LOG

SAMPLE LOCATION: BALLISTICS POND LOGGED BY: WFG SAMPLE NO.: BP-3

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		BP-3 was retained but not logged due to low sample recovery. Chemical analysis was not performed, either. Sample BP-4 was obtained from the Ballistics Pond in the vicinity of this location as a replacement.

TEST RESULTS

[illegible]

SAMPLE LOG

PROJECT NAME: Olin Ecu/ENV DATE: 6/30/84 PROJECT NO.: 5408.00
SAMPLE LOCATION: Ballistics Pond LOGGED BY: WFG SAMPLE NO.: BP-4

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-8"	CL?	Photo IBO Olive brn very soft clay? near saturation. Feels like Jello. Tube head imprint in top of sample. 5Y 3/2
8-19"±	Sludge	Blk "jello" sludge. Interval 12"-19" sheared during extraction. 2.5Y 2/0
19"-33"	Sludge? Clay?	Blk & olive brn marbled clay/sludge. 5Y 2.5/2 - 2.5Y 2/0

TEST RESULTS

[illegible]

AVRES

SAMPLE LOG

PROJECT NAME: Olivia Eco/ENV

DATE: 7/1/84

PROJECT NO.: 3408.00

SAMPLE LOCATION: Ballistic Pond

LOGGED BY: WFG

SAMPLE NO.: BP-5

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-22"	Sludge	IB20 photo (2)
END		Black color in upper part changing to olv. brn w/ blk mottles deeper. Chocolate pudding texture. Saturated & v. soft in upper part, firmer below. Color when mixed 2.5Y2/0

TEST RESULTS

[illegible]

SAMPLE LOG

SAMPLE LOCATION: Ballistics Pond LOGGED BY: WEG SAMPLE NO.: BP-6

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-8" ±	Sludge	<p>Photo IA24</p> <p>Streaked blk.-gray sludge. color 7.5YR 2/0 (moist)</p> <p>sample taken with a clam shell bottom sampler. Then transferred to shelly tube for transport.</p>

TEST RESULTS

[illegible]

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AYRES
ASSOCIATES
SAMPLE LOG

PROJECT NAME: Olin Ecd/ENV DATE: 7/3/84 PROJECT NO.: 3408.00
SAMPLE LOCATION: Control Pond LOGGED BY: WFG SAMPLE NO.: Spike 1

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-6"	SM	ID 16 Dk. brn silty fine sand. Tr gravel. 5Y 3/2
6"-18"	SP	Yellowish brn uniform fine sand, some thin silty bands, Bottom 2" darker brn & mottled. Tr fine gravel. 10 YR 4/4
<u>END</u>		

TEST RESULTS

[illegible]

SAMPLE LOG

PROJECT NAME: Oldw Eco/Env DATE: 7/3/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Control Pond LOGGED BY: WFG SAMPLE NO.: Spike 2

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-11	SM	photo ID 17 Dk. brn silty fine sand w/ Tr gravel. 5Y 3/2
11-17"	SP	Yellow-brn uniform fine sand. Tr plant root or twig 10YR 4/4
17"-23"	SM	Brn. Silty sand. 1 1/2" wood piece at 18". 2.5Y 4/2
23"-29"	SP	Yellow brn silty fine sand. Some olv.-brn silty zone that separate from the sand. 10YR 4/4
<u>END</u>		

TEST RESULTS

[illegible]

AYRES
ASSOCIATES

PROJECT NAME: Olin Eco/Env. DATE: 7/3/84 PROJECT NO.: 3408.00
SAMPLE LOCATION: Control And LOGGED BY: WFG SAMPLE NO.: Spikes 3

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-12"	SM	ID 15 Dk brn - brn silt & Fine sand. Decaying root @ 9". 5Y3/2
12-19"	SP	Brn. (yellowish) fine, uniform sand. Tr. gravel. Some silt in top 1". 10YR6/6
19"-30"	SM	Yellowish brn fine sand mixed w/ "clods" of olv. brn silt contain some clay. 10YR4/4
<u>End</u>		

TEST RESULTS

[illegible]

SAMPLE LOG

PROJECT NAME: Min Eco/Env DATE: 7/3/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Control Pond LOGGED BY: WFG SAMPLE NO.: Spike 4

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo I D 13
0 - 8"	SM	Dk Brn. fine sand & silt. w/ roots. 5Y 3/2
8" - 12"	SP	Yellowish brn. uniform fine sand. 10YR 6/6
12" - 18"	SM	Brn. silty fine sand. 5Y 4/2
18" - 26"	SP	Yellowish brn uniform fine sand. One 1" gravel piece at 19". 10YR 6/6
<u>END</u>		

TEST RESULTS

[illegible]

AYRES
ASSOCIATES

PROJECT NAME: Olin Eco/Eau DATE: 7/3/84 PROJECT NO.: 3408.00
SAMPLE LOCATION: Control Pond LOGGED BY: WFG SAMPLE NO.: Spike 5

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		ID12
0-8"	ML	Dk brn silt & fine sand. Abundant roots in top 2". 2.5-4 3/2
8-27"	SP	Yellow brn, uniform fine sand. 1" layer of mottled brn silt. 104R 7/4
END		

TEST RESULTS

[illegible]

AYRES
ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/ENV DATE: 7/3/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Control Pond LOGGED BY: WFG SAMPLE NO.: Spiky 6

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-6"	ML	ID 11 Dk brn silt. Top 3" over saturated. 3"-6" near saturation. 542.5/2
6"-11"	SM	Ol. gry f-med. sandw/ tr. gravel. Bottom 2" has 1/4" layers of dk dv brn silt & no gravel. 545/1
<u>END</u>		

TEST RESULTS

[illegible]

AYRES

SAMPLE LOG

PROJECT NAME: Old F.C. / ENV

DATE: 7/3/84

PROJECT NO.: 3408.00

SAMPLE LOCATION: Control Pond

LOGGED BY: WFG

SAMPLE NO.: SP: 4.2

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-4"	SM	photo I 010 Dk gray-brn fine-med sand w/ some silt. Abundant organic plant debris. 542.5/2
4-9"	SP	gray-brn fine sand. Abundant fine roots. Tr cs sand. 543/2
<u>END</u>		

TEST RESULTS

[illegible]

AYRES
ASSOCIATES
SAMPLE LOG

PROJECT NAME: Olin Eco/ENV DATE: 7/3/84 PROJECT NO.: 3408.00
SAMPLE LOCATION: Control Pond LOGGED BY: WFC SAMPLE NO.: Spike 8

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-6"	SP	photo ID 9 Gry brn f.-med sand w/ abundant grass, twigs, & other organic plant matter Tr. gravel. 54311
<u>END</u>		

TEST RESULTS

[illegible]

SAMPLE LOG

SAMPLE LOCATION: Final Creek LOGGED BY: PSW SAMPLE NO.: FC-1

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IA-20 (2)
0-2"	SP	Sand, fine grained, medium brown (7.5YR 5/4) trace silt, 1/4" thick silty seam at 2"
2-5"	SP	sand, fine grained, light brown (10Y 6/3) trace of silt, wood fibers
5-10"	ML?	Silt?, medium reddish-brown, saturated and mushy (5YR 3/4)
10-14"	SM	Sand, coarse to fine, medium reddish-brown (7.5YR 3/4), small gravel bottom 1 1/2"
14"-27"	SP	Sand, coarse to fine, medium yellow-brown, trace silt, scattered fibers
		Atterberg Pan M-1 Perm sample 20"-27"

TEST RESULTS

[illegible]

SAMPLE LOG

PROJECT NAME: Olin ECO/ENV DATE: 7-1-84

PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Creek LOGGED BY: PSW

SAMPLE NO.: FC-2

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo I C 6
0-4"	OL	Silt, dark brown (10YR4/1) with straw, roots, fibers, snail shells, organic smell, saturated
4"-10"	OL	Silt, black (7.5YR2/0) with strong organic smell, a little sub angular gravel at bottom, trace sand, saturated, firm
10"-17"	ML	Silt, medium gray-brown (10YR3/2), sandy, with a few scattered mottles, firm, saturated
17"-23"	GM	Gravel, medium gray-brown (10YR3/1), fine to coarse grained, sub angular to subrounded, with some silt and sand, friable, saturated
23"-25"	SM	Sand, dark brown (5YR2.5/1), fine to coarse grained, with some silt and subrounded gravel, wet
		Atterberg pan S-98

TEST RESULTS

[illegible]

AYRES

SAMPLE LOG

PROJECT NAME: Olivia Ego/Enu

DATE: 6/29/84

PROJECT NO.: 3408.00

SAMPLE LOCATION: Fish Creek

LOGGED BY: WFG

SAMPLE NO.: EC-3

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0 - 9"	SM	Photo IA27 Dk. brown silt w/ some fine sand. Cross bedded @ 2-3" is ± clean fine sand vein w/ powder pellet $\frac{5}{16}$ " Ø S-42.5/1
9-16"	SW	± clean fn - cs sand. $\frac{1}{8}$ " powder pellet at top of zone. $\frac{5}{16}$ " powder pellet at 10". Thin zone @ 16" contains 50% $\frac{1}{32}$ " Ø Powder pellets. 2.543/2
16" - 29"	SP - sm?	Olive brn to black silty fine sand. w/ to cs sand to fn grav. Top 2" v. near saturation. S-42.5/2
End		

TEST RESULTS

[illegible]

SAMPLE LOG

PROJECT NAME: Qin Eco/Envu

DATE: 2/1/84

PROJECT NO.: 340800

SAMPLE LOCATION: Einal Creek

LOGGED BY: WEG

SAMPLE NO.: FC-4

DEPTH

SAMPLE CLASSIFICATION

DESCRIPTION

Q-9"

CL

Photo IB29

Dk gray brn stiff silty clay w/ some v.f. sand. Few roots. 542.5/1

9"-28"

sm

DK brn. Silt and sand w/ Tr grav.
10 YR 3/2

END

TEST RESULTS

[illegible]

MT-4
6-8'

SAMPLE LOG

PROJECT NAME: Olin Eco/ENV DATE: 6/30/84 PROJECT NO: 3408.00
SAMPLE LOCATION: Final Creek LOGGED BY: WFG SAMPLE NO.: FC-6

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-5"	SM	photo IB18 Dk. Brn - blk silty sand. Some fine blk sub-angular grains (charcoal?)
5-26"	SP-SM	Dk brn to brn, silty, gravelly sand. Strong organic decay odor 5-13". Small zone at ~20" contains small blk and grains in association w/ gold colored metallic grains. Later shows one ^{sh.} plane i.e. v. thin. look somewhat like muscovite mica.
<u>END</u>		NOTE: Muscovite mica confirmed under microscope. Small black grains believed to be mica books viewed on edge.

TEST RESULTS

[illegible]

AYRES
ASSOCIATES

SAMPLE LOG

PROJECT NAME: Old Eco/Env DATE: 7/1/84 PROJECT NO.: 3408.00
SAMPLE LOCATION: Ford Creek LOGGED BY: WFB SAMPLE NO.: FC-8

SAMPLE LOCATION: Fine Creek LOGGED BY: WFB SAMPLE NO.: FC-8

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo ID 28
0-6"	SP (SM)?	Gry fine-med sand w/ few 1/8" veins dk gry silt 2:54 5/2
6-8"	SM	Dk gry silty fine sand. Roots common. 54 3/1
8"-12"	SP-SM	Gry & Oliv. silt and sand w/ a few blk nodules. 54 4/4
12"-26"	ML	Olv. brn med-fn sand and silt. Tr gravel (weathered sandstone). 54 4/4
END		Perm 14"-20"

TEST RESULTS

[illegible]

AYRES

ASSOCIATES

SAMPLE LOG

PROJECT NAME: Old Eca/ENV DATE: 7/1/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pond LOGGED BY: WFG SAMPLE NO.: FPI-1

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-22"	ML	photo I C O Dk. brn clayey silt. Top 3" thick root zone. Few f. roots throughout. Slightly darker near bottom 10 YR 3/1
End		

TEST RESULTS

[illegible]

AYRES
ASSOCIATES

PROJECT NAME: Olin Eco/ENV DATE: 7/2/84 PROJECT NO: 3408.00
SAMPLE LOCATION: Final Pond 1 LOGGED BY: WFB SAMPLE NO.: FPI-2

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0 - 19"	ML	photo IC 11 Dk. brown, crumbly silt w/ some clay. A few tap roots extend through interval. 2.5 Y 3/2
19" - 30"	ML	Brn. Silt w/ fine blk "specks" of unknown origin. Specks are cylindrical and tend to be sub-vertical. They are easily broken w/ thumb nail & resemble carbon when broken open. Dia $\approx \frac{1}{32} - \frac{1}{16}$ " 10 YR 3/2
<u>END</u>		
		Perm. 24 - 30"

TEST RESULTS

[illegible]

AYRES
ASSOCIATES

PROJECT NAME: On Eco/Env DATE: 7/1/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pond 1 LOGGED BY: WFC SAMPLE NO.: FPI-3

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo IC.3
0-4"	SM	Brn. silty fn sand 10YR 4/4
4"-13"	SP	Rusty brn fn sand. 7.5YR 5/6
13-29"	SP	Brn f-m. sand. Bottom 3" is moist (near sat.) and contains some silt. 7.5YR 4/6
<u>End</u>		

TEST RESULTS

[illegible]

AYRES
ASSOCIATES
SAMPLE LOG

PROJECT NAME: Olinda Eco/ENV DATE: 7/2/84 PROJECT NO.: 3708.00

SAMPLE LOCATION: Fine Pond 1 LOGGED BY: WFG SAMPLE NO.: FPI-5

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0 - 12"	ML	photo IC 15 Dk. brn, soft-firm silt w/ tr v.f. sand. Slightly crumbly. Tr. v.f. roots. From 8"-12" some blk, large mottles are found which are saturated. Water comes out when squeezed. Plant leaf @ 4". 5Y2.5/2 few snail shells.
12" - 20"	ML - OL ?	Blk, organic , soft, saturated silt and (organics ?) 1/2" layers of plant stems @ 12" & 15". From 18"- 20" get increasing amount of v.f. sand, found in thin (1/4") layers w/ silt., alternating light & dark. 2.5Y2/0 - 5Y2.5/1
20 - 27"	SM	Blk, sandy silt w/ a few roots. near saturation. Some coarse sand. Also fine blk granules. 2.5Y2/0
<u>END</u>		Sample taken in water at pond outlet. Perm 4"-9"

TEST RESULTS

[illegible]

SAMPLE LOG

PROJECT NAME: Olin Eco/ENV DATE: 7-1-84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pond I LOGGED BY: PSW SAMPLE NO.: FPI-6

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-7"	ML	Silt, dark brown (5YR 2.5/1) with trace organics, roots - topsoil
7"-12"	ML	Silt, medium gray-brown (5YR 3/1) scattered roots and fibers
12"-25"	ML	Silt, medium yellow-brown (10YR 4/2) trace of mottling along root channels
		Photo IC 2 Atterberg Can <u>6</u>

TEST RESULTS

[illegible]

AYRES
ASSOCIATES

PROJECT NAME: Olin ECO/ENV DATE: 7/1/84 PROJECT NO.: 3408

SAMPLE LOCATION: Fine And I LOGGED BY: WFG SAMPLE NO.: FPI-7

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-6"	CL	photo I c 1 Mottled Dk brn w/ lt. brn spots, firm, Silty clay 5Y2.5/2
6-17"	CL	Dk. brn, stiff, clay. some fine roots. Color grades into next lower interval. 5Y2.5/1
17"-24"	CL	Olv. brn clay. stiff. 10YR 3/3
<u>END</u>		

TEST RESULTS

[illegible]

SAMPLE LOG

PROJECT NAME: Oil in Eco/ENV DATE: 7/1/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Final Pond 1 LOGGED BY: WFC SAMPLE NO.: FPI-8

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0 - 9"	ML	Photo IC5 moist, firm, dk olv:brn silt. Bottom 1" is banded brn & blk and contains ~50% v.f. sand. 542.5/2
9" - 19"	SM	brn. f. sand w/ some zones of blk sandy silt. Some ss sand included. Some hard blk pieces up to 3/8" seem to be coal. 2.544/4 - 2.542/0
19" - 25"	SM	Yellowish-brn. f.-m. sand and silt. w/ some clay. 2.544/4
<u>END</u>		Perm 19"-25" sample taken in 1ft. water.

TEST RESULTS

[illegible]

AYRES
ASSOCIATES

PROJECT NAME: Olin ECO/ENV DATE: 7-1-84 PROJECT NO: 3408.00

SAMPLE LOCATION: Final Pond I LOGGED BY: PSW SAMPLE NO.: EPI-9

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-2"	SM	Sand, medium yellow-brown (10YR 4/3 & 10YR 5/6) fine grained, with a little silt, a little subangular to subrounded gravel, friable, moist
2"-10"	CL	Clay, medium yellow-brown (2.5Y 5/2) with a little subangular gravel, moist, firm, with scattered sandy pockets
10"-26"	ML	Silt, medium yellow-brown (10YR 5/2) scattered mottling, roots
		Photo IC4 Atterberg Can MT 29

TEST RESULTS

[illegible]

SAMPLE LOG

SAMPLE LOCATION: Final Pond 1 LOGGED BY: WFC SAMPLE NO.: FPI-10

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-4"	SM	Sample taken in water. (7") photo IC 14 Brn. fn-med sand w/ irregular lenses of dk. brn silt-clay. 10YR2/2
4"-25"	ML-DL	dk. olv. brn w/ blk zones. Soft silt. At 4-5" is transition from above. @ 5", 10" 13", 17", & 19" are 1/2" to 1" layers of black, partially decayed leaves & leave stems and few twigs. In layers @ 10" & 19" is a thin (1/16") layer of lt. gry, fine clay or silt. In-between layers have texture of jello/pudding. DK. brn fine silty sand.
25"-27"	SM	10YR2/2
END		Perm 19 1/2 - 25

TEST RESULTS

[illegible]

SAMPLE LOG

PROJECT NAME: Olin ECO/ENV DATE: 6/29/84 PROJECT NO: 3408.00
SAMPLE LOCATION: Final Pond I LOGGED BY: PSW SAMPLE NO: FPI-12

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-6"	ML	Photo IA-22 (2) Silt, black (5YR2.5/1), with some fine sand
6"-11"	ML	Silt, dark gray-brown (2.5Y 3/2) with a little fine sand
11"-28.5"	ML	Silt, medium gray-brown (5Y 4/2) with orange mottling (2.5YR 4/6).
		Perm sample 17"-23" Atterberg Pan M-1 ✓

TEST RESULTS

[illegible]

AYRES
ASSOCIATES
SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/1/84 PROJECT NO.: 3408.00
SAMPLE LOCATION: Final Pond 1 LOGGED BY: WFG SAMPLE NO.: FPI-14

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo ID 27
0 - 1½"	ML	Brn. silt (top soil). Roots. 10YR 2/2
1½" = 19"	CL	stiff, Oliv. gry sandy, silty, clay. Tr grav. Sand is in scattered zones & is brn. 5Y 4/3
19" - 23"	SM	Dk. brn gravelly sand and silt. 5Y 3/2
End		

TEST RESULTS

[illegible]

AVRES

ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/ENV DATE: 6/30/84 PROJECT NO: 3408.00

SAMPLE LOCATION: Final Pond 2 LOGGED BY: WFC SAMPLE NO.: EPTI-1

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo IB16
0 - 6	ML	Brn. clayey silt. w/ blk and lt. gry laminations. 0-2" Sod w/ roots. Fractures approx. parallel to laminations 5YR 2.5/2
6" - 13"	ML	Dk brn to blk, crumbly, silt, w/ blk pieces up to 3/8" w/ sub-conchoidal fractures. (carbon charcoal?) 5YR 2.5/1
- 18"	SC	Brn. gravelly, sandy clay. 10 YR 3/3
18" - 23"	SP	Ang, weathered sandstn gravel and sand. Tan - (yellowish) 5YR 6/8
<u>END</u>		
		Perm @ 2" - 6"

TEST RESULTS

[illegible]

AYRES
ASSOCIATES

SAMPLE LOG

PROJECT NAME: Old Ego/ENV DATE: 7/2/84 PROJECT NO: 3408.00

SAMPLE LOCATION: Fernal Pond LOGGED BY: WFG SAMPLE NO.: FPII-2

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0 - 8"	ML	Photo IC29 Dk. brn silt. Top 2" top soil. From 2"-3½" slight laminations are visible. From 3"-5" light colored lumps are present. Appear to be residual weathered rock still retaining the relic angular shape. From 3"-8" are found crumbly black chunks that readily break when touched. Resemble carbon. It leaves a black streak and does not behave like weathered rock. 10 YR 3/2
8" - 14"	ML	Dk brn silt. Only few light weathered areas as above. Blk lumps are not present. This zone has fine voids laying horizontally giving some hint at bedding. Voids decrease as 14" is approached. 7.5 YR 3/2
14" - 23"	SM	Yellowish-brn sand layered w/ olive gry silt. 1" sand zone at top. layers are ~¼". 7.5 YR 5/8
23" - 25" END	SP	Tan, gravelly, med-co sand. 10 YR 6/3

TEST RESULTS

[illegible]

AYRES

SAMPLE LOG

PROJECT NAME: Olin Eco / ENV

DATE: 7/2/84

PROJECT NO.: 3408.00

SAMPLE LOCATION: Fine Pond 2

LOGGED BY: WFO

SAMPLE NO.: FPII-3

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0 - 16"	ML	photo IC16 DK brn silt w/ organic debris. Tr. sand. 0-4" saturated sand & tr grav. 13"-16" is saturated to near sat, and contains more sand than above. Also 3" long by 3/4" wood. 542.5/2
16 - 26"	ML	Olv. brn, sandy, silt. (non-homogeneous). Some zones very clayey. 545/3
<u>END</u>		Sample taken in 4" water. Perm 22-26"

TEST RESULTS

[illegible]

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AYRES
ASSOCIATES

PROJECT NAME: Olin Eco/ENV DATE: 6/28/84 PROJECT NO: 3408.007

SAMPLE LOCATION: Fine Pond 3 LOGGED BY: WFG SAMPLE NO.: FP III-1

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-3"	ML	Photo IA 15 Dk. brn. silt - low plasticity. Tr fine gravel. 5YR 2.5/2
3"-18"	SM	Dk. brn sand and silt w/ some gravel - mostly in upper 7" of zone. Grav. is weathering sandstn. 5YR 2.5/2
18"-24"	ML	Med. brn silt w/ some sand. low - mod plasticity. Tr of wht gravel. 2.5 YR 3/4
End		Note: Sample was 28" in Shelby Tube but after extraction was 24" w/ no soil loss

TEST RESULTS

[illegible]

AYRES
ASSOCIATES

PROJECT NAME: Olin BAAP DATE: 6/28/84 PROJECT NO: 3408.00

SAMPLE LOCATION: Final Pond 3 LOGGED BY: WFG SAMPLE NO.: FP III-2

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IA 13
0-12"	S.M	Dark brn silty fn sand. 542.5/1
12"-27"	SP	Lt. Brn st fine sand. 7.5 YR 6/4
END		Perm. sample 7"-12"

TEST RESULTS

[illegible]

AYRES
ASSOCIATES
SAMPLE LOG

PROJECT NAME: Olson Eco/EMU DATE: 6/30/84 PROJECT NO.: 7408.00
SAMPLE LOCATION: Fernal Pond 3 LOGGED BY: WJG SAMPLE NO.: EP III-3

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-5"	CL	photo I B 15 Olv. brn silty clay w/ tr fine sand. Roots to 2". Slightly mottled & stiff. 5Y4/3
5"-8"	CL	V. stiff sand and clay w/ tr. grav. Olv. brn. Clay binder is v. plastic. 5Y4/3
8"-28"	SM	Brn. silty fine sand w/ tr Tr grav. @ 12-20". Cs sand & up to 2 1/2" Ø grav from 20"-28". 2.5Y5/6
END		

TEST RESULTS

[illegible]

AYRES
ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olin Eco/ENV DATE: 6-29-84 PROJECT NO: 3408.00
SAMPLE LOCATION: Final Pond LOGGED BY: PSW SAMPLE NO.: FP IV-4

PROJECT NAME: Olin Eco/ENV DATE: 6-29-84 PROJECT NO: 3408.00
SAMPLE LOCATION: Final Pond LOGGED BY: PSW SAMPLE NO.: FP IV-4

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-1 1/2"	(OL) ML	Silt, dark brown, with roots and organics 10YR 2/1
1 1/2-7"	ML	Silt, dark brn 10YR 3/1
7-10"	ML	Silt, dark brown, with sand and gravel, fine roots 10YR 3/1
10-19"	SM	Sand, silty, stratified, with med. yellow brown seams in dark brown matrix 10YR 3/2

Photo IA 17

Perm sample 13"-18"
Atterberg Pan S-19

TEST RESULTS

[illegible]

AYRES
ASSOCIATES

PROJECT NAME: Olin Eco/Env DATE: 6/28/84 PROJECT NO.: 3408
SAMPLE LOCATION: Final Pond 3 LOGGED BY: WFG SAMPLE NO.: FPIII-5

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IAS
0-12"	ML	Brn. sandy silt. stiff. Increasing sand downward. 5YR 3/3
12-26"	SP	Light Brn. fine-med. sand. 2" at bottom is moist gravelly, silty sand. 10YR 4/3
END		

TEST RESULTS

[illegible]

SAMPLE LOG

SAMPLE NO.: FP III-6

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-20"	ML	Photo. IA 10 ~ Lt. brn clayey silt w/ dk brn. mottle @ 2"-4". 1 1/2" gravel piece 6". Grades to sandy silt @ 16". Some gravel present. 5YR 4/3
20-24"	SP	Lt. brn sand w/ some gravel. 2.5Y 4/4
END		

TEST RESULTS

[illegible]

SAMPLE LOG

SAMPLE NO.: FP III-7

End

TEST RESULTS

1-3

SAMPLE LOG

PROJECT NAME: Olin BAAF DATE: 6/28/84 PROJECT NO.: 3409.00

SAMPLE LOCATION: Fine And 3 LOGGED BY: WFG SAMPLE NO.: FPH-8

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0 - 12"	ML	(2) Photo. I A 9 Dk. brn. silt w/ tr. gravel. Lower 6" mottled w/ lt. brn silt. 5YR 3/2
12 - 18"	ML	lt. brn silt. w/ some dk. brn mottles. 5YR 4/4
18" - 24"	ML	Dk. brn. silt as in 0-12" above. bottom 1" has 15-35% fn sand. Color as 0-12" but w/ dk mottle of 5YR 2.5/2
END		

TEST RESULTS

[illegible]

AYRES
ASSOCIATES

PROJECT NAME: Olin Eco/Env DATE: 6-29-84 PROJECT NO.: 3408,00

SAMPLE LOCATION: Fingl Pond III LOGGED BY: PSJ SAMPLE NO.: FP III-9

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-6"	ML	Photo IA-21 Silt, black (7.5YR 2.5/0), scattered gravel, roots
6"-16	ML	Silt, dark brown (10YR 2/2) with a little sand and small gravel, roots
16-23"	SM	Sand, dark brown (7.5YR 3/2), with silt
23-29"	SP	Sand, medium brown (7.5YR 3/4), fine to coarse grained, trace silt and small gravel

TEST RESULTS

[illegible]

AYRES

SAMPLE LOG

PROJECT NAME: 01111 ECO/ENV DATE: 6-29-84

PROJECT NO.: 3408.00

SAMPLE LOCATION: El Estero Pond III LOGGED BY: PSW

SAMPLE NO.: FP-III-10

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-28"	ML	<p>Photo 1A 23</p> <p>Silt, med. brown (5YR 4/3), with sand and gravel, scattered roots</p> <p>Perm sample 22-28"</p>

TEST RESULTS

[illegible]

AVRES

SAMPLE LOG

PROJECT NAME: Old Eco/Env

DATE: 6/30/84

PROJECT NO.: 3408.00

SAMPLE LOCATION: Field Pond 3

LOGGED BY: WFG

SAMPLE NO.: FP II - 11

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IS 9
0 - 3"	SP	Tan fine sand 7.5YR 5/4
3" - 5"	ML	nearly saturated, brn silt. fine roots present. small red ants present. 7.5YR 3/2
5" - 8"	SP	Silty, brn, fn sand w/ tr cs sand 5YR 3/3
8" - 27"	SP	Lt. brn. uniform fine sand. Zone of fn. blk sand in narrow band @ 14" - 16" ±. Broken, weathered blk rock. well rounded. ~2" Ø. 7.5YR 6/4
END.		

TEST RESULTS

[illegible]

SAMPLE LOG

PROJECT NAME: Olden Eco/ENV DATE: 6/30/84 PROJECT NO.: 3408
SAMPLE LOCATION: Final Pond 3 LOGGED BY: WFC SAMPLE NO.: FP11-12

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0 - 11"	SM	Photo IB10 Dk. brn silty fine sand. (Top soil) Tr. gravel. 5 1/2 2.5/2
11" - 25"	SP	Brn to Tan uniform, fine sand. Tr gravel. Color lightens downward. 1 1/2" Ø piece grav. @ 21" 2.5 1/2 5/6
End		

TEST RESULTS

[illegible]

AYRES
ASSOCIATES

PROJECT NAME: Olin Eco/ENV DATE: 4/28/84 PROJECT NO.: 3408.00
SAMPLE LOCATION: Final Pond III LOGGED BY: WFC SAMPLE NO.: FP III-13

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-4"	ML	Photo IA 7 Top soil w/ grass roots. 5YR 2.5/2 Brn - Blk.
4"-12"	ML	Blk. sandy silt. 5YR 2.5/1
12"-23"	ML	Blk to brn stiff silt w/ tr. sand. 5YR 2.5/2 Perm. sample 18"-23"
END		

TEST RESULTS

[illegible]

AYRES
ASSOCIATES
SAMPLE LOG

PROJECT NAME: 01 in BAP DATE: 6/28/84 PROJECT NO.: 3408.98
SAMPLE LOCATION: Fine Beds Ditch LOGGED BY: WFG SAMPLE NO.: FP III - 14

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-7"	ML	Photo I A 8 Dark brn. silt w/ tr. sand. SYR 3/2
7-15"	ML	Brn. silt w/ fn. sand. SYR 3/4
END		

TEST RESULTS

[illegible]

AYRES
ASSOCIATES

SAMPLE LOG

PROJECT NAME: Old Env/Eco DATE: 6/29/84 PROJECT NO: 3408.00

SAMPLE LOCATION: Final Pond 3 - ^{Drainage} Ditch LOGGED BY: WFC SAMPLE NO.: FPTII-15

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-11"	SM-SC	Photo IA 14 Mostly brn-gry fine sand but contain alternating layers of dk-brn to blk silt w/ Some sand. → 10YR 3/1
11-16"	ML	Firm dk-brn to blk silt w/ tr fine sand. 5Y 2.5/1
-26"	SP	Brn fine-med sand. Tr of ang. fn grav. 5.5YR 4/2
END		

TEST RESULTS

[illegible]

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AYRES
ASSOCIATES
SAMPLE LOG

PROJECT NAME: Old Eas/Env DATE: 6/29/84 PROJECT NO.: 3408.00
SAMPLE LOCATION: Easel Pond LOGGED BY: WFC SAMPLE NO.: FPT-1

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-2"	SP	photo. IA-29 med. sand w/ some grav. & silt, grass roots. Brown. 10 YR 3/3
2"-8"	ML	DK. brn to blk silt w/ tr. fn sand. 10R2.5/1
8"-26"	SC	Blk silty sand. 13-15" zone has some cs. sand - v.f. grav. 10R2.5/1
END		

TEST RESULTS

[illegible]

AYRES
ASSOCIATES

PROJECT NAME: Old Eco/ENV

DATE: 6/30/84

PROJECT NO.: 3408, 00

SAMPLE LOCATION:

LOGGED BY: WEG

SAMPLE NO.: FPII-2

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0 - 9"	ML	Photo IB5 Dk. greenish brown sandy silt. crumbly. some scattered within lamellae of lighter silt. SY 3/1
9" - 17"	ML	Dk dr. blk, crumbly silt (no sand). Multiple fine roots. SY 2.5/1
17" - 26"	ML	Blk silt w/ tr. sand. multiple fine roots. 2.5 Y 2/0
END		

Perm @ 13" - 17"

TEST RESULTS

[illegible]

AYRES
ASSOCIATES

PROJECT NAME: Old DATE: 7/1/84 PROJECT NO.: 3408.00
SAMPLE LOCATION: Final Pond 4 LOGGED BY: WFC SAMPLE NO.: FPTV-4

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-26"	CL	<p>IB24 photo</p> <p>DK. brn to blk silty clay w tr. v.f. sand. Fine roots thru zone. At 7"-8" is layer of lighter color (brn.) w/ concentration of fine roots. Darker zone 10"-18"±. color 10"-18" 5Y2.5/1. Remainder is color 5Y2.5/2</p>
END		<p>Perm @ 8"-14"</p>

TEST RESULTS

[illegible]

SAMPLE LOG

SAMPLE NO.: AP-11-5

End

TEST RESULTS

MT-10
16-19

AYRES
ASSOCIATES

PROJECT NAME: Olin Eco/Env DATE: 6/30/84 PROJECT NO: 3408.00

SAMPLE LOCATION: Final Pond 4 LOGGED BY: WFG SAMPLE NO.: FPIT-6

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-4	ML	Photo - IB11 Dk. brn silt w/ tr sand. Contains some blk granules - composition uncertain. resembles carbon. 5Y2.5/2
4"-25"	CL	Dk brn clay. Slightly marbled w/ brn lamellae. Fine roots throughout. Firm near top, stiffens down. 5Y2.5/1
22-26"	ML	Blk, crumbly silt w/ fine sand (tr - some). 2.5Y2/0
END		

TEST RESULTS

[illegible]

AYRES

ASSOCIATES

SAMPLE LOG

PROJECT NAME: Olus Ew/Env

DATE: 7/1/84

PROJECT NO: 3408.00

SAMPLE LOCATION: Fine Pond 4

LOGGED BY: WFC

SAMPLE NO.: FPV-7

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-23"	CL	Photo IB 22 Gry-brn clay. At 9" is a 1" zone of silty, v.f. sand mixed w/ clay. Top 5" is root zone. 542.5/2
23-28"	CL	Blk, silty clay w/ tr sand. 2.542/0 w/ 1" zone of 542.5/1
End		

TEST RESULTS

[illegible]

AYRES
ASSOCIATES
SAMPLE LOG

PROJECT NAME: Olin BAAP DATE: 6/28/94 PROJECT NO.: 3408.00
SAMPLE LOCATION: Final Pond 4 LOGGED BY: WFG SAMPLE NO.: FPTV-10

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-2"	SP	Photo I A. 12 moist. brn fine sand 2.54 3/2
2" - 30"	SP	lt. tan fine sand. 2.54 6/2
END		24"-30" perm sample (M-23)

TEST RESULTS

[illegible]

AYRES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env

DATE: 7/1/84

PROJECT NO.: 3408.00

SAMPLE LOCATION: Nitro Pond

LOGGED BY: WFG

SAMPLE NO.: NG-1

DEPTH

SAMPLE CLASSIFICATION

DESCRIPTION

0-7"

Sm

photo IC7
gry. f. sand & silt. Silt component
increases to bottom. Top 2" is near
saturation.

7"-10"

$$mL / sm$$

v. stiff, marbled dk brn & gry silt.
1" vein of silt w/ 50%± of f. sand at
8½' - 10"

11-26"

CL

Gr-y-brn, v. stiff clay. Some v. fine sand, mostly in thin ($\frac{1}{16}$, $\frac{1}{8}$ ") layers from 19"-26". Soil tends to break apart on the sand layers. From 20"-24" also have varves of clay/silt \pm v.f. sand.

END

Perm 2"-7"

TEST RESULTS

SAMPLE

ATTERBERG LIMITS

UNIT WEIGHTS

STRENGTH PARAMETERS

DEPTH

LIQUID

PLASTIC

PLASTICITY

WFF

2007

CONCLUSIONS

THE

2010

TYPE	DATE	TIME	LOCATION	REMARKS
1	10/10/1964	10:00	1000	1000
2	10/10/1964	10:00	1000	1000
3	10/10/1964	10:00	1000	1000
4	10/10/1964	10:00	1000	1000
5	10/10/1964	10:00	1000	1000
6	10/10/1964	10:00	1000	1000
7	10/10/1964	10:00	1000	1000
8	10/10/1964	10:00	1000	1000
9	10/10/1964	10:00	1000	1000
10	10/10/1964	10:00	1000	1000
11	10/10/1964	10:00	1000	1000
12	10/10/1964	10:00	1000	1000
13	10/10/1964	10:00	1000	1000
14	10/10/1964	10:00	1000	1000
15	10/10/1964	10:00	1000	1000
16	10/10/1964	10:00	1000	1000
17	10/10/1964	10:00	1000	1000
18	10/10/1964	10:00	1000	1000
19	10/10/1964	10:00	1000	1000
20	10/10/1964	10:00	1000	1000
21	10/10/1964	10:00	1000	1000
22	10/10/1964	10:00	1000	1000
23	10/10/1964	10:00	1000	1000
24	10/10/1964	10:00	1000	1000
25	10/10/1964	10:00	1000	1000
26	10/10/1964	10:00	1000	1000
27	10/10/1964	10:00	1000	1000
28	10/10/1964	10:00	1000	1000
29	10/10/1964	10:00	1000	1000
30	10/10/1964	10:00	1000	1000
31	10/10/1964	10:00	1000	1000
32	10/10/1964	10:00	1000	1000
33	10/10/1964	10:00	1000	1000
34	10/10/1964	10:00	1000	1000
35	10/10/1964	10:00	1000	1000
36	10/10/1964	10:00	1000	1000
37	10/10/1964	10:00	1000	1000
38	10/10/1964	10:00	1000	1000
39	10/10/1964	10:00	1000	1000
40	10/10/1964	10:00	1000	1000
41	10/10/1964	10:00	1000	1000
42	10/10/1964	10:00	1000	1000
43	10/10/1964	10:00	1000	1000
44	10/10/1964	10:00	1000	1000
45	10/10/1964	10:00	1000	1000
46	10/10/1964	10:00	1000	1000
47	10/10/1964	10:00	1000	1000
48	10/10/1964	10:00	1000	1000
49	10/10/1964	10:00	1000	1000
50	10/10/1964	10:00	1000	1000
51	10/10/1964	10:00	1000	1000
52	10/10/1964	10:00	1000	1000
53	10/10/1964	10:00	1000	1000
54	10/10/1964	10:00	1000	1000
55	10/10/1964	10:00	1000	1000
56	10/10/1964	10:00	1000	1000
57	10/10/1964	10:00	1000	1000
58	10/10/1964	10:00	1000	1000
59	10/10/1964	10:00	1000	1000
60	10/10/1964	10:00	1000	1000
61	10/10/1964	10:00	1000	1000
62	10/10/1964	10:00	1000	1000
63	10/10/1964	10:00	1000	1000
64	10/10/1964	10:00	1000	1000
65	10/10/1964	10:00	1000	1000
66	10			

UNCONV

FINED

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FRANC

SECTION 5

FOOTING

5-97

-24

AYRES
ASSOCIATES
SAMPLE LOG

PROJECT NAME: Olina Eco/ENV DATE: 6/30/84 PROJECT NO.: 3408.00
SAMPLE LOCATION: Nitro Pond LOGGED BY: WFG SAMPLE NO.: NG-2

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo IB 13
0-12"	CL	Dk. olv. grn clay w/ tr. cs sand (ang.). over saturated in top 1"-2". Saturated to about 7". Lg piece wood @ 12". Soft to firm, when unsaturated. 5Y2.5/2
12.-22"	CL	Dk olv. grn clay (as above) but w/ brown clay mixed; in irregular lenses and smears. Stiff. Tr. gravel.
END		5Y2.5/2 w/ 5Y4/2

TEST RESULTS

[illegible]

AYRES
ASSOCIATES

PROJECT NAME: Olin Eco/ENV DATE: 6/30 PROJECT NO.: 3408.00

SAMPLE LOCATION: Nitro Pond LOGGED BY: WFC SAMPLE NO.: NG-3

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo. IB 4
0-1"	OL	oli. brn organic muck, v. soft & sat. 5Y 3/2
1"-15"	CH	dk. olv. grn., stiff to v. stiff clay 5Y 2.5/2
16"-27"	CL	Brn. clay, stiff. Some darker zones toward bottom. Large, weathered, rounded sands & gravel, beginning 20"-22" 10YR 3/3
END		

Perm @ 16-20"

TEST RESULTS

[illegible]

m-7

AYRES
ASSOCIATES
SAMPLE LOG

PROJECT NAME: Ohn BAAP DATE: 6/30/84 PROJECT NO: 3408.00
SAMPLE LOCATION: Nitro Pond LOGGED BY: WFG SAMPLE NO.: NG-4

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0 - 9"	ML	Photo IB2 Olive brn silt w/ some fine sand. Drier w/ depth. 5Y 3/1
9" - 14"	ML	Olive to brn fine sandy silt w/ tr. grav. Lower contact @ ~200 w/ horizon. Sand inc. to bottom. 5Y 3/2
14" - 19"	SP	Lt. brn sand, fine 2.5Y 4/4
19 - 22"	ML	Olive fn sandy silt. Stiff. small dark specks. Thin sandy vein @ 21". 5Y 4/4
END		PERM 9" - 14"

TEST RESULTS

[illegible]

219

PROJECT NAME: Olin BAPP DATE: 6/28/84 PROJECT NO.: 3408.00
SAMPLE LOCATION: Nitrocity Pond LOGGED BY: WFG SAMPLE NO.: NG-5

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo IA 11
0 - 4" (approx)	ML	Gry. Brn. silt w/ some clay. Moderately plastic. 5YR 3/1
4" - 12"	SM	Gry. fine - med. sand. 8 - 12" has gry brn laminations of clayey silt. 2.5Y 5/2
12" - 25" (approx.)	SP	Brn. fine - med. sand. 3" gravelly layer @ 17". Beginning @ 20" sand is finer w/ tr. grav. Bottom 1" contains fine laminations of gry. silt. 2" plant stem or root in bottom. 10YR 6/6

END

TEST RESULTS

[illegible]

SAMPLE LOG

PROJECT NAME: 01 in Eco/ENN DATE: 6/30/84 PROJECT NO: 3408.00
SAMPLE LOCATION: Nitro Pond-2nd try LOGGED BY: WFC SAMPLE NO.: NG-6

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo IB 14
0-11"	CL	Olv. brn silt w/ some clay. Some fine roots 5"-9". 543/1
11-21"	SC-SM	Olv. brn. clayey sand. Seams of clean fine sand w/ thin lamellae of clay from 16"-21". 543/1
21-24"	CL	Olv. brn., stiff clay w/ fine varves of blk clay alternating w/ v.f. sand-silt. 543/1
End		

TEST RESULTS

[illegible]

AVRES

SAMPLE LOG

PROJECT NAME: Olin Eco/Env

DATE: 6/30/84

PROJECT NO.: 3408.00

SAMPLE LOCATION: Nitro Pond - 2ndary

LOGGED BY: WEG

SAMPLE NO.: NG-7

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo IB7
0-4"	SP-SM	Dk. brn silty sand w/ grass & Roots. 10YR 3/3
4"-10"	SP	Brn - tan gravelly sand. Gravel is sub-angular to rounded. Rusty at top fading to tan downward. 10YR 5/8
10"-25"	CL	Gray - brn, plastic, stiff clay. color tends to darken w/ depth. 5YR 2.5/2
End		

TEST RESULTS

[illegible]

AYRES
ASSOCIATES
SAMPLE LOG

PROJECT NAME: Olin Eco/ENV DATE: 6/30/84 PROJECT NO.: 3408.00
SAMPLE LOCATION: Nitro Pond-2 LOGGED BY: WFG SAMPLE NO.: NG-8

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-24"	CL	Photo IB12 Dk. brn, v. stiff clay. Thin streaks of lighter color. Top 3" is grass root zone.
END		

TEST RESULTS

[illegible]

AVRES

PROJECT NAME: Olin Eco/ENK

DATE: 6/27/84

PROJECT NO.: 3408.98

SAMPLE LOCATION: Oleum Pond

LOGGED BY: WFG

SAMPLE NO.: CP-1

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo IA3
0-4"	ML	Gry., moist, silt w/ roots. color 10R3/1 (moist.) Strong organic/sulfur smell.
4"-12"	ML	Gry.-brn. - silt w/ some sand. Roots continue. Color grading lighter w/ depth. color 5YR4/4
12"-27"	ML	Brn. sandy silt. - low- ^{mod.} plastic. Roots - fewer than above. color 7.5 YR 4/6
<u>END</u>		

TEST RESULTS

[illegible]

SAMPLE LOG

PROJECT NO.: 3408

SAMPLE NO.: OP-3

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-23"	ML (MH)?	photo IC 12 Gry, soft, clayey silt. Over saturated in top 2", below sat. deeper. Much root material top 3". It Becomes darker gray & stiffer @ 13". Organic or chemical smell @ top. 2.5 YR 4/0
23"-32.	ML	Lt. gray, soft clayey silt near saturation, some dark mottles. 5 YR 6/2
<u>End</u>		
		Perm 16"-21"

TEST RESULTS

[illegible]

AYRES
ASSOCIATES
SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/1/84 PROJECT NO.: 3408.00
SAMPLE LOCATION: Olson Pond LOGGED BY: WFG SAMPLE NO.: OP-4

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-5"	OL	photo I B 19 Soft, gray - blk, saturated fine grained much w/ organics. Decreasing saturation w/ depth & grading into interval below. 2.542/0
5'-31"	CL	Gry - brn, clay. Firm at top to v. stiff below. Bottom 2" are darker color. 544/1
<u>END</u>		

Perm 19-25"

TEST RESULTS

[illegible]

AYRES
ASSOCIATES
SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/1/84 PROJECT NO: 3408.00
SAMPLE LOCATION: Olewin Pond LOGGED BY: WFG SAMPLE NO: OP-5

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-28"	SP	<p>photo IB21</p> <p>Tan, uniform fine sand. From 10-28" sand is moist to near saturation. From 11"-12" zone has soft silt and is gray-tan color. 12"-16" has trace silt. color 2.5Y 7/4 (fairly dry)</p>
<u>END</u>		
		Perm 17"-22" (L-11)

TEST RESULTS

[illegible]

AYRES
ASSOCIATES
SAMPLE LOG

PROJECT NAME: Olin Eco/ENV DATE: 6/26/84 PROJECT NO.: 3408.98
SAMPLE LOCATION: Oleum Pond LOGGED BY: WJFG SAMPLE NO.: OP-6

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0 - 3.75'		Photo I 40
0 - 6"	SP	fn - med. lt. brn. sand. Roots to 5" Layer of gry. clayey silt @ 5" - 6" w/ roots. 10 YR 6/3
6" - 9"	SP	fn - med. gel. - brn sand,
End.		2.5 Y 5/4
		NOTE: No sample fraction remaining after chemical analysis.

TEST RESULTS

[illegible]

AYRES

SAMPLE LOG

PROJECT NAME: Olin BAAI

DATE: 6/28/84

PROJECT NO.: 3408.98

SAMPLE LOCATION: Cleum Pond

LOGGED BY: WFG

SAMPLE NO.: OP-7

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-6"	CL	Stiff brn. sandy clay color 5YR 3/4
6-18"	CL	Brn. sandy clay w/ gravel. tight Tan 1" zone of silty fine sand near end. Some 1" gravel, few pieces weathered angular sandstn. Color 5YR 3/3
END		Photo I A 4

TEST RESULTS

[illegible]

SAMPLE LOG

PROJECT NAME: 0/In Eco/ENV DATE: 7/2/84 PROJECT NO: 3408.00

SAMPLE LOCATION: Oleum Pond - ^{Upper} Ditch LOGGED BY: WFG SAMPLE NO.: OP-8

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-12"	SM	photo IC 10 Dk. brn. silt and sand. w/ some gravel. Roots to 6". At bottom of zone is an area of fine dk granular material w/ quartz. Appears to be severely weathered dk. xtaline rock. Muscovite mica also present. 7.5YR 4/6
12"-26"	SP	brn to tan, uniform, fine sand w/ some grav. Gravel is mostly in top 1/2 of interval. Sand color lightens downward. 10YR 6/6 (moist) 10YR 7/3 (dry)
		Perm 20"-26"

TEST RESULTS

[illegible]

SAMPLE LOG

PROJECT NAME: Olin - Eco/ENV. DATE: June 27, 1984 PROJECT NO.: _____

SAMPLE LOCATION: Oleum Pond - ^{Upper} Drain LOGGED BY: WFG SAMPLE NO.: OP-9

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0 - 7"	ML	Photo I A2 Brn., w. silt w/ tr. grav. Stiff. Discard 0-1" - grav. Fr. roots thru zone. some dark mottles.
7" - 29"	ML	Brn., v. stiff silt w/ tr. fn sand. 1"x1" pocket severely weathered xtaline rock at 9" depth. Single 1/4" Ø root at 20" - 23". Crumbly when squeezed w/ fingers. Afterburgs 5-2 14"-15"
END		color 5YR 4/4

TEST RESULTS

[illegible]

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AYRES
ASSOCIATES
SAMPLE LOG

PROJECT NAME: Old Eco/ENV DATE: 7/3 PROJECT NO: 3408.00

SAMPLE LOCATION: Rocket Drainage LOGGED BY: WFB SAMPLE NO.: RAD-2

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0 - 3"	ML	photo I D O Brn Silt w/ tr. of sand and gravel. 10 YR 3/3
3" - 15"	SM	Silty fine sand and some gravel. Gravel is rounded and not weathered. 10 YR 5/4
END		

TEST RESULTS

[illegible]

SAMPLE LOG

PROJECT NAME: Olin Eng/ENV DATE: 7/2/84 PROJECT NO: 7408.00

SAMPLE LOCATION: Rocket Drive LOGGED BY: WFG SAMPLE NO.: RAD-3

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo IC 13
0-2"	ML	Dk. gry - Brn, gravelly, silt. Some fine roots. 542.5/2
2"-26"	CL	Olv. gry - brn., mottled, soft silty clay. Moderately plastic. Severely weathered rock @ 26". 544/2
<u>END</u>		
		Perm 15"-21"

TEST RESULTS

[illegible]

SAMPLE LOG

PROJECT NAME: Old Eco/Env

DATE: 7/2/84

PROJECT NO.: 3408.04

SAMPLE LOCATION: Dec

LOGGED BY: WFC

SAMPLE NO.: RAD-4

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0 - 12"	ML	photo IC 28 Dk. brown sandy silt. Tr of co sand & fine gravel. Roots mostly in top 8". 542.5/1
12 - 15"	ML	Brn. fine-med sand and silt. Vague dk bands $\frac{1}{32}$ - $\frac{1}{16}$ " thick. 104R 3/2
16" - 28"	CL	Gry silty clay. Strong odor. Clay mottled w/ blk granules & blk & rusty spots and vertical . . . seams. Blk zone containing some sand and $\frac{3}{4}$ " dia wood at 15"-17" in one side of soil core. 104R 5/2
END		

TEST RESULTS

[illegible]

SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/2/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Rocket Drilling LOSS BY: WEG SAMPLE NO.: RAD-5

Derm 4"-9"

TEST RESULTS

C-12
10-15

AYRES
ASSOCIATES

PROJECT NAME: Mlin Eco/ENV DATE: 7/3/84 PROJECT NO: 3408.00
SAMPLE LOCATION: Rocket Drainage LOGGED BY: WFG SAMPLE NO.: RAD-7

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-14"	CL	photo ID 4 Brn & Dk brn, stiff - v. stiff clay and silt. Top 3" show layering (~1/8"). Remainder has marbling & irregular swirls of dk brn & lighter silty clay. Some fine and one 1/8" dia. "carbon" granules in bottom 3". One 2" gravel piece at 12". 10YR 3/2 - 5Y 5/3
14"-22"	SM	Brn. Ln to med sand w/ occasional silty zones. 7.5YR 4/4
22"-26"	ML	Dk gry brn silt w/ some fine sand, fine roots and other fine organics. 5Y 3/1

TEST RESULTS

[illegible]

SAMPLE LOG

PROJECT NAME: Oliver Eco/Env DATE: 7/3/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Rocket Drains CLOSED BY: WFB SAMPLE NO.: RAD-8

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-6"	ML	photo ID 5 Dk brn silt w/ fine sand. Some Roots. 10YR 2/1
6-9"	SP	Brn med. sand 5YR 3/4
9"-14"	ML	Lt. & Dk brn silty fn sand. Sand streaks are lt. brn., silty areas are darker. Some layering. Silt fraction increasing downward. 1/4" root @ 10". 5YR 3/2
14"-20"	CL	Olv. brn, stiff silty clay. some fine blk granules (carbon?) 10YR 4/3
20"-28"	SM-SC	Brn clayey, silty sand. Tr. gravel. 5YR 3/4
End		Perm 22"-27"

TEST RESULTS

[illegible]

SAMPLE LOG

PROJECT NO.: 3408.00

SAMPLE NO.: RAD-9

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-13"	ML	photo Ic30 Brn. silt w/ some sand, Tr. gravel. Abundant roots up to 1/2" dia. Slightly lighter color toward bottom indicates transition to next layer. 10YR3/3
13-23"	SM	Lt. brn f. sand w/ some silt. and tr lg gravel. At 16" § 22" is a 1/4" layer of fine sand size black granules in association w/ gold color metallic appearing grains also f. sand size. Some gold grains are platy & some seem blocky. Platy grains strongly resemble muscovite mica. Between 16" § 20" are scattered thin layers of blk silty material. 7.5YR4/4
END		

TEST RESULTS

[illegible]

AYRES
ASSOCIATES
SAMPLE LOG

PROJECT NAME: Olin Eco/ENV DATE: 7/2/84 PROJECT NO.: 3408.00
SAMPLE LOCATION: Rocket Drainage LOGGED BY: WFG SAMPLE NO.: RAD-10

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-9"	ML	photo IC19 Brn silt & fine sand. Fine roots to 9". 5YR 4/4
9"-33"	SM	Alternating zones of sandy silt & silty sand. Dk. olv. brown. Sandy silt zones have dk mottles and a wavy, marbled appearance. 5YR 3/4
33"-27"	SM	Yellowish-brn uniform fine sand w/ some silt. 1/8" blk sand size material (@ 35" (non-magnetic) Carbon? 10YR 5/6

TEST RESULTS

[illegible]

SAMPLE LOG

SAMPLE NO.: RAD-11

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-11"	SM	photo - IC 20 (2) Brn silty sand. Bottom 3" are lighter in color, contain less silt and the sand seems to be finer. At 4"-8" the silt is banded in the sand and is darker. 7.544/4
11"-20"	ML	Blk silt. crumbly. Turning toward brn in bottom 2". Top ~2" containing thin cylindrical tubes of fine sand w/in blk silt. Tubes are sub-vertical and are 1"-2" long. A 1/4" twig or root is horizontal @ 17". 2.542/0
20-29"	ML	Brn. soft clayey silt. Darker brn bottom 1"-2". All of this interval was squeezed out of Shelby tube when the sample was extruded. 104R4/3 - 2.543/2 NOTE: Shelby Tube contained water upon opening.

TEST RESULTS

[illegible]

SAMPLE LOG

PROJECT NAME: Oliva Eco/ENV DATE: 7/2/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Rocket Drainage LOGGED BY: WFG SAMPLE NO.: RAD-12

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-8"	ML	photo IC18 Brn sandy silt w/ few blk mottles. Top 2" are darker brn w/ light colored mottles. 5"-8" is blk w/ light mottles & is crumbly, also tends to fracture ~ horizontally. 104R3/4, (2.542/0) (542.5/2 0-2")
9"-28"	SM	Dk. brn f. sand & silt. From 13"-16" is severely weathered rock but still contains some hard fragments. 104R3/4
		Perm 16"-21"

TEST RESULTS

[illegible]

AYRES
ASSOCIATES
SAMPLE LOG

PROJECT NAME: Olin Eco/ENV DATE: 7/2/84 PROJECT NO.: 3408.00
SAMPLE LOCATION: Recket Drains LOGGED BY: WFC SAMPLE NO.: RAD-13

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-2"	SP-sm	Photo IC 17 Brn. silty fine sand w/ tr. gravel. some fine roots. 10YR 3/3
2"-12"	SP-sm	Tan silty fine sand. Silt tends to occur in clumps which do not contain much sand. 10YR 6/4 & 10YR 4/4 (silt clumps).
12"-29"	SP-sm	Brn. silty fine sand, 1/2" silty layer @ ~ 22". The primary difference between 2"-12" & 12"-29" is one of color. 10YR 4/6
END		

TEST RESULTS

[illegible]

AYRES
ASSOCIATES
SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 7/2/84 PROJECT NO: 3408.00

SAMPLE LOCATION: Rocket Drains LOGGED BY: WFG SAMPLE NO.: RAD-14

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-12"	SM	photo IC 32 Brn. silty fine sand w/ roots 10YR 4/4
12"-28"	SM	Yellowish-brn uniform fine sand, Occurring in alternating layers w/ brn silt. Silt layers < 1" thick except bottom 3" which is one silt zone composed of multiple $\frac{1}{8}$ - $\frac{3}{16}$ " layers. Zone splits on layer bedding. Layers contain v.f. sand. 10YR 5/8
End		

TEST RESULTS

[illegible]

AYRES
ASSOCIATES

PROJECT NAME: Olin Eco/ENV DATE: 7/2/84 PROJECT NO.: 3408.00
SAMPLE LOCATION: Rocket Drains LOGGED BY: WFG SAMPLE NO.: RAD-15

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-6"	SM	photo IC 21 Dk. brn silt & fine sand. 54 3/4
6"-27"	SM	Brn uniform fine sand w/ some silt. Most silt is in layers up to 1/2" thick which are concentrated in interval 14"-19", 7.5 g 25/8
		Perm 20"-25"

TEST RESULTS

[illegible]

SAMPLE LOG

PROJECT NO.: 3408.00

SAMPLE NO.: RAD-16

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
0-6"	SM	photo IC25 Brn. silty sand w/ roots. (Topsoil, Loam) 10 YR 3/2
6'-15"	SM	Tan silty uniform fine sand. From 12"-15" soil is in discs ~1" thick which are predominantly silt (light brn-gry.) 10 YR 5/6
15"-28"	SM	Brn. sandy silt in 1" to 2" discs. Sand fraction is very uniform. 5 Y 5/4
28"-30"	SP	Light Tan clean fine sand. 10 YR 7/4
<u>END</u>		

TEST RESULTS

[illegible]

SAMPLE LOG

PROJECT NAME: Air Eco/ENV DATE: 7/2/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Rocket Drainage LOGGED BY: WFG SAMPLE NO.: RAD-17

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo IC 27
0-9"	SM	Silty, brn., fine sand. (moist) Some fine roots. A few small, discontinuous silty zones. 5YR 4/4
9-16"	SM	Dk. brown fine sand w/ more silt than above interval. Approx 30-45% silt. Darker mottles are present. Bottom 2" show v. thin sandy lenses. 10YR 3/2
16-31"	SP	Brn. uniform fine sand. Top 4" has dark brn gritty colored zones and lenses. 10YR 6/6
END		

TEST RESULTS

[illegible]

SAMPLE LOG

SAMPLE NO.: RAD-18

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		photo IB17
0-3"	ML	Brn. silt w/ some v.f. sand. 10YR 3/3
3"-17"±	SM	Yellowish-tan v.f. uniform sand w/ some silt. 2.5Y 5/6
17"-27"	SP	Tan v.f. uniform sand. 10YR 6/6
END		
		Perm @ 21-27"

TEST RESULTS

[illegible]

AYRES
ASSOCIATES
SAMPLE LOG

PROJECT NAME: Olin Eco/Env DATE: 6/30/84 PROJECT NO.: 3408.00

SAMPLE LOCATION: Rocket Drainage LOGGED BY: WFC SAMPLE NO.: RAD-20

DEPTH	SAMPLE CLASSIFICATION	DESCRIPTION
		Photo. I B 6
0-3"	ML	Brn top soil w/ roots. Silt 10YR 3/2
3"-8" ±	SM	Brn silty fine sand. w/ roots 10YR 3/2
8"-30"	SP	Brn to tan uniform fine sand. 2.5 Y 6/4
END		

TEST RESULTS

[illegible]

BORING LOGS

Boring Description	Contractor	Date Installed
Background Wells		
BGM-91-01	ABB-ES	10/28/91
BGM-91-01X	ABB-ES	10/27/91
BGM-91-02	ABB-ES	11/6/91
BGM-91-03	ABB-ES	11/7/91
Propellant Burning Ground		
PBB-91-01	ABB-ES	10/12/91
PBB-91-02	ABB-ES	10/12/91
PBB-91-03	ABB-ES	10/12/91
PBB-91-04	ABB-ES	10/14/91
PBB-91-05	ABB-ES	10/15/91
PBB-91-06	ABB-ES	10/13/91
PBB-91-07	ABB-ES	10/13/91
PBB-90-01	ABB-ES	8/23/90
PBB-90-02	ABB-ES	8/23/90
PBB-89-01	ABB-ES	1/23/89
PBB-89-02	ABB-ES	1/25/89
PBB-89-03	ABB-ES	2/1/89
PBB-89-04	ABB-ES	2/6/89
PBB-89-05	ABB-ES	2/13/89
PBB-89-06	ABB-ES	2/14/89
PBB-89-07	ABB-ES	2/17/89
PBB-89-10	ABB-ES	1/19/89
PBB-82-01	Warzyn	2/18/82
PBB-82-02	Warzyn	2/22/82
PBB-82-03	Warzyn	2/18/82
PBB-82-04	Warzyn	2/22/82
PBB-82-05	Warzyn	2/16/82
PBB-82-06	Warzyn	2/16/82
PBB-82-07	Warzyn	2/16/82
PBB-82-08	Warzyn	2/17/82
PBP-91-01	ABB-ES	10/13/91
PBP-91-02	ABB-ES	10/14/91
PBN-91-06C	ABB-ES	10/22/91
PBN-91-06D	ABB-ES	10/12/91
PBN-91-12C	ABB-ES	10/23/91
PBN-91-12D	ABB-ES	10/16/91
PBN-89-01D	ABB-ES	1/20/89
PBN-89-02C	ABB-ES	3/19/89
PBN-89-04C	ABB-ES	4/16/89
PBM-89-05	ABB-ES	3/3/89
PBM-89-07	ABB-ES	3/3/89
PBM-89-09	ABB-ES	3/1/89
PBN-89-10D	ABB-ES	3/7/89

PBM-89-11
PBN-89-12B
PBM-85-01
PBM-85-02
PBM-85-03
PBM-85-04
PBM-85-05
PBM-85-06
PBN-85-01A
PBN-85-02A
PBN-85-03A
PBN-85-04A
PBM-82-01
PBM-82-02
PBM-82-03
PBM-82-04
PBM-82-05
PBN-82-01A
PBN-82-01B
PBN-82-01C
PBN-82-02A
PBN-82-02B
PBN-82-02C
PBN-82-03A
PBN-82-03B
PBN-82-03C
PBN-82-04A
PBN-82-04B
PBN-82-04C
PBN-82-05A
PBN-82-05B
PBN-82-05C

ABB-ES	3/7/89
ABB-ES	4/15/89
AEHA	9/22/85
AEHA	9/17/85
AEHA	9/18/85
AEHA	9/24/85
AEHA	9/28/85
AEHA	10/4/85
AEHA	9/15/85
AEHA	10/1/85
AEHA	10/3/85
AEHA	9/30/85
Warzyn	3/18/82
Warzyn	3/17/82
Warzyn	3/16/82
Warzyn	3/16/82
Warzyn	3/17/82
Warzyn	3/18/82
Warzyn	3/10/82
Warzyn	3/9/82
Warzyn	5/1/82
Warzyn	3/8/82
Warzyn	3/9/82
Warzyn	3/15/82
Warzyn	3/15/82
Warzyn	3/13/82
Warzyn	3/12/82
Warzyn	3/13/82
Warzyn	3/11/82
Warzyn	3/13/82
Warzyn	3/11/82
Warzyn	3/11/82

Landfill 1

LOB-90-01
LOB-90-02
LOM-91-01
LOM-91-02
LOM-89-01
LON-89-02B
LON-89-03B

ABB-ES	8/21/90
ABB-ES	8/21/90
ABB-ES	10/10/91
ABB-ES	10/25/91
ABB-ES	2/17/89
ABB-ES	2/18/89
ABB-ES	2/20/89

Settling Ponds and
Spoils Disposal Area

SPB-91-01
SPN-91-02D
SPN-91-03D
SPN-91-04D
SPN-89-01C
SPN-89-02C
SPN-89-03C
SPN-89-04C

ABB-ES	10/14/91
ABB-ES	10/9/91
ABB-ES	10/8/91
ABB-ES	10/2/91
ABB-ES	3/29/89
ABB-ES	4/14/89
ABB-ES	4/13/89
ABB-ES	3/30/89

Deterrent Burning Ground

DBB-91-01	ABB-ES	10/15/91
DBB-91-02	ABB-ES	10/16/91
DBB-91-03	ABB-ES	10/16/91
DBB-89-01	ABB-ES	1/20/89
DBB-89-02	ABB-ES	1/11/89
DBB-89-03	ABB-ES	1/9/89
DBB-82-01	Warzyn	3/11/82
DBB-82-02	Warzyn	3/10/82
DBB-82-03	Warzyn	2/24/82
DBB-82-04	Warzyn	3/9/82
DBN-89-02B	ABB-ES	2/2/89
DBN-89-04B	ABB-ES	2/7/89
DBM-82-01	Warzyn	3/22/82
DBM-82-02	Warzyn	3/19/82
DBN-82-01B	Warzyn	3/23/82
DBN-82-01C	Warzyn	3/22/82

Existing Landfill

ELB-82-01	Warzyn	3/12/82
ELB-82-02	Warzyn	3/15/82
ELB-82-03	Warzyn	3/11/82
ELB-82-04	Warzyn	2/23/82
ELB-82-05	Warzyn	2/23/82
ELB-82-06	Warzyn	3/17/82
ELN-91-07A	ABB-ES	11/10/91
ELN-91-07B	ABB-ES	11/9/91
ELM-91-10	ABB-ES	11/13/91
ELN-89-02A	ABB-ES	1/24/89
ELM-89-03	ABB-ES	1/25/89
ELM-89-05	ABB-ES	2/1/89
ELM-89-07	ABB-ES	4/18/89
ELM-89-08	ABB-ES	4/1/89
ELM-89-09	ABB-ES	4/13/89
ELN-82-01A	Warzyn	3/29/82
ELN-82-01B	Warzyn	3/30/82
ELN-82-01C	Warzyn	3/29/82
ELN-82-02A	Warzyn	4/1/82
ELN-82-02B	Warzyn	4/1/82
ELN-82-02C	Warzyn	4/2/82
ELN-82-03A	Warzyn	3/24/82
ELN-82-03B	Warzyn	3/25/82
ELN-82-03C	Warzyn	3/24/82
ELN-82-04A	Warzyn	3/26/82
ELN-82-04B	Warzyn	3/26/82
ELN-82-04C	Warzyn	3/25/82

**Rocket Paste Area
Nitroglycerine Pond**

NPM-89-01	ABB-ES	10/25/89
RPM-91-01	ABB-ES	10/25/91
RPM-89-01	ABB-ES	10/16/89
RPM-89-02	ABB-ES	10/13/89

New Acid Area

NAN-81-01A	Olin	1981
NAM-81-02B	Olin	1981
NAN-81-03B	Olin	1981
NAN-81-04B	Olin	1981

Oleum Plant and Pond

OPB-91-01	ABB-ES	10/29/91
OPB-91-02	ABB-ES	10/10/91
OPB-91-03	ABB-ES	10/10/91
OPB-91-04	ABB-ES	10/11/91
OPB-91-05	ABB-ES	10/11/91
OPB-91-06	ABB-ES	10/23/91
OPB-91-07	ABB-ES	10/23/91
OPB-91-08	ABB-ES	10/23/91
OPB-91-09	ABB-ES	10/23/91
OPB-91-10	ABB-ES	10/23/91
OPB-91-11	ABB-ES	10/23/91
OPB-91-12	ABB-ES	10/23/91
OPB-91-13	ABB-ES	10/23/91
OPB-89-01	ABB-ES	11/13/89
OPB-89-02	ABB-ES	10/14/89
OPB-89-03	ABB-ES	10/12/89
OPB-89-04	ABB-ES	10/13/89
OPB-89-05	ABB-ES	10/10/89
OPB-89-06	ABB-ES	10/26/89
OPB-89-07	ABB-ES	10/25/89
OPB-89-08	ABB-ES	10/26/89
OPB-89-10	ABB-ES	10/26/89
OPB-89-11	ABB-ES	10/26/89
OPB-89-12	ABB-ES	10/25/89
OPB-89-13	ABB-ES	10/26/89
OPM-89-01	ABB-ES	11/13/89
OPM-89-02	ABB-ES	10/27/89
OPM-89-03	ABB-ES	11/11/89

Old Acid Area

OAB-91-01	ABB-ES	10/9/91
OAB-91-02	ABB-ES	10/9/91
OAB-91-03	ABB-ES	10/16/91
OAB-89-01	ABB-ES	10/17/89
OAB-89-02	ABB-ES	10/24/89
OAB-89-03	ABB-ES	10/17/89

OAM-91-01	ABB-ES	10/27/91
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Old Fuel Oil Tank

FTB-91-01	ABB-ES	10/22/91
FTB-91-02	ABB-ES	10/22/91
FTB-89-01	ABB-ES	10/24/89
PHM-91-01	Olin	6/6/91
B-1	Olin	6/5/91
B-2	Olin	6/5/91
B-3	Olin	6/6/91
B-4	Olin	6/7/91

Off-Post (South)

PBN-91-01C	ABB-ES	10/24/91
PBN-91-02B	ABB-ES	9/28/91
PBN-91-02C	ABB-ES	9/30/91
PBN-91-03B	ABB-ES	9/26/91
PBN-91-03C	ABB-ES	9/27/91
PBM-90-01D	ABB-ES	8/24/90
PBM-90-02D	ABB-ES	8/19/90
PBM-90-03D	ABB-ES	8/16/90
PBN-90-04B	ABB-ES	8/6/90
PBN-90-04D	ABB-ES	8/5/90
SWN-91-01B	ABB-ES	10/15/91
SWN-91-01C	ABB-ES	10/16/91
SWN-91-01D	ABB-ES	10/14/91
SWN-91-02C	ABB-ES	10/22/91
SWN-91-03B	ABB-ES	10/8/91
SWN-91-03C	ABB-ES	10/2/91
SWN-91-03D	ABB-ES	10/1/91
SWN-91-03E	ABB-ES	11/10/91
SWN-91-03X	ABB-ES	11/7/91
SWN-91-04C	ABB-ES	10/13/91
SWN-91-04D	ABB-ES	10/9/91
SWN-91-05B	ABB-ES	10/12/91
SWN-91-05C	ABB-ES	10/12/91
SWN-91-05D	ABB-ES	10/10/91

Base-wide

S1101	Warzyn	12/13/79
S1103	Warzyn	11/2/79
S1106	Warzyn	11/14/79
S1107	Warzyn	1/10/80
S1108	Warzyn	12/29/80
S1109	Warzyn	2/14/80
S1110	Warzyn	1/15/80
S1111	Warzyn	1/2/80
S1112	Warzyn	1/4/80
S1114	Warzyn	11/20/79
S1116	Warzyn	12/11/79
S1117	Warzyn	2/13/80

S1118	Warzyn	11/30/79
S1119	Warzyn	1/22/80
S1120	Warzyn	1/17/80
S1121	Warzyn	1/18/80
S1122	Warzyn	1/25/80
S1123	Warzyn	12/28/80
S1124	Warzyn	12/19/79
S1125	Warzyn	
S1126	Warzyn	2/11/80
S1127	Warzyn	2/8/80
S1128	Warzyn	12/19/79
S1129	Warzyn	2/7/80
S1131	Warzyn	12/6/79
S1132	Warzyn	2/4/80
S1147	Warzyn	1983
S1148	Warzyn	1983
S1149	Warzyn	1983
S1150	Warzyn	1983
S1151	Warzyn	1983
S1152A	Warzyn	9/26/85
S1152B	Warzyn	9/24/85
S1153	Warzyn	9/19/85

FIELD BORING LOG				Boring No. BLM-91-01	
Project No. 06953-03		Project Name BADGER AAP		Page 1 of 1	
Contractor LAYNE		Driller G. RODRIGUEZ		Date started 10-28-91 completed 10-28-91	
Method DUAL WALL		Casing Size 9" O.D.		HNU 11.7/10.2	
Ground EL		Soil Drilled 78'		Protection Level D	
		2' below ground 64.5'		Total Depth 78'	
Logged by ROR		Checked by DRP		Date 10/30/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		
						HNU	LEL	
S-1	0-10'			BROWN CLAYEY SILT, RD, TR F SAND, COHESIVE, PLASTIC DAMP.	(SW)	0	0	0
S-2	10-20			LT BROWN-RED SILTY SAND, WED, C, SOME M, SOME F GRAVEL.	(SW)	0	0	0
SPON #1	20-22'	12/24/91			ANALYTICAL SAMPLES 20-22'			
S-3	NO SAMPLE TAKEN			20-30'				
S-4	30-40'			LT BROWN SAND, WED, M-C	(SW)	0	0	0
SPON #2	40-42'	7/12/14/22		LITTLE F, LITTLE F GRAVEL	ANALYTICALS TAKEN	0	0	0
S-5	40-50			SAME AS ABOVE	(SW)	0	0	0
S-6	50-60			SAME AS S-4	(SW)	0	0	0
SPON #3	60-62'	6/9/12/22			ANALYTICALS TAKEN. WATER IN SEDIMENTS	0	0	0
S-7	60-70			LT BROWN SAND, RD, M LITTLE C, LITTLE F, LITTLE SILT	(SP) 64.5			
S-8	70-78'			LT BROWN SILTY SAND, RD, F.	(SP)			
				B.O.E. = 78'				
				//////	78'			
				SANDSTONE				

FIELD BORING LOG				Boring No. BGM-91-012	
Project No. 06853-03		Project Name <u>TRAILER AAP</u>		Page <u>1</u> of <u>1</u>	
Contractor <u>LAYNE</u>		Driller <u>G. RODRIGUEZ</u>		Date started <u>10-27-91</u> completed <u>10-27-91</u>	
Method <u>DUAL WALL</u>		Casing Size <u>9" O.D.</u>	HNU <u>11.7/10.2</u>	Protection Level <u>D</u>	
Ground El.		Soil Drilled <u>40'</u>	<u>2</u> below ground —	Total Depth <u>40'</u>	
Logged by <u>RRR</u>		Checked by <u>DRP</u>		Date <u>10/30/91</u>	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		
						HNU	LEL	
S-1	0-10'			BROWN CLAYEY SILT, A-L, TR F SAND. COHESIVE DAMP (SM)		JAR	AIR	0
S-2	10-20'		10-17' 17-20	SAME AS ABOVE LT BROWN SAND, WGD, C, SOME F GRAVEL, SOME M SAND. (SW)		0	0	0
Spoon #1		7/9/8/10			ANALYTICAL SAMPLE TAKE 20-22'			
S-3	20-30'			LT BROWN SAND, WGD, M-C SOME F, LITTLE F GRAVEL, TR SICT (SW)		0	0	0
S-4	30-40'		30-34 34-36	SAME AS S-3 BROWNISH-RED SILTY SAND, WGD, C, SOME M, LITTLE F, LITTLE F GRAV SLIGHTLY COHESIVE, LENSES OF GREY CLAY. WEATHERED SANDSTONE FROM 36-410 (SW-SM)		0	0	0
				B.O.E. = 40'				
				BEDROCK = 38-40'				
				SANDSTONE				
				Boring Abandoned on 10/28/91				

FIELD BORING LOG			Boring No. BGM-91-02		
Project No. 06853-03		Project Name BANGER AAP		Page 1 of 1	
Contractor LAYNE		Driller G. RODRIGUEZ		Date started 11-5-91 completed 11-6-91	
Method DUAL WALL		Casing Size 9" O.D.		HNU 11.71102	
Ground El.		Soil Drilled 87'		Protection Level D	
		2' below ground 76.5		Total Depth 87'	
Logged by RRR		Checked by DRP		Date 11/11/91	

FIELD BORING LOG				Boring No. BGM-91-02	
Project No. 06853-03		Project Name BANGER AAP		Page 1 of 1	
Contractor LAYNE		Driller G. RODRIGUEZ		Date started 11-5-91 completed 11-6-91	
Method DUAL WALL		Casing Size 9" O.D.		HNU 11.71102	
Ground El.		Soil Drilled 87'		Protection Level D	
		2' below ground 76.5		Total Depth 87'	
Logged by RRR		Checked by DRP		Date 11/11/91	

FIELD BORING LOG			Boring No. BGM-91-02		
Project No. 06853-03		Project Name BANGER AAP		Page 1 of 1	
Contractor LAYNE		Driller G. RODRIGUEZ		Date started 11-5-91 completed 11-6-91	
Method DUAL WALL		Casing Size 9" O.D.		HNU 11.71102	
Ground El.		Soil Drilled 87'		Protection Level D	
		2' below ground 76.5		Total Depth 87'	
Logged by RRR		Checked by DRP		Date 11/11/91	

FIELD BORING LOG				Boring No. BGM-91-02	
Project No. 06853-03		Project Name BANGER AAP		Page 1 of 1	
Contractor LAYNE		Driller G. RODRIGUEZ		Date started 11-5-91 completed 11-6-91	
Method DUAL WALL		Casing Size 9" O.D.		HNU 11.71102	
Ground El.		Soil Drilled 87'		Protection Level D	
		2' below ground 76.5		Total Depth 87'	
Logged by RRR		Checked by DRP		Date 11/11/91	

FIELD BORING LOG			Boring No. BGM-91-02	
Project No. 06853-03		Project Name BANGER AAP		Page 1 of 1
Contractor LAYNE		Driller G. RODRIGUEZ	Date started 11-5-91 completed 11-6-91	
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.71102	Protection Level D	
Ground El.	Soil Drilled 87'	± below ground 76.5	Total Depth 87'	
Logged by RRR	Checked by DRP	Date 11/11/91		

FIELD BORING LOG			Boring No. BGM-91-02	
Project No. 06853-03		Project Name BANGER AAP		Page 1 of 1
Contractor LAYNE		Driller G. RODRIGUEZ	Date started 11-5-91 completed 11-6-91	
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.71102	Protection Level D	
Ground El.	Soil Drilled 87'	± below ground 76.5	Total Depth 87'	
Logged by RRR	Checked by DRP	Date 11/11/91		

FIELD BORING LOG			Boring No. BGM-91-02	
Project No. 06853-03		Project Name BANGER AAP		Page 1 of 1
Contractor LAYNE		Driller G. RODRIGUEZ	Date started 11-5-91 completed 11-6-91	
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.71102	Protection Level D	
Ground El.	Soil Drilled 87'	± below ground 76.5	Total Depth 87'	
Logged by RRR	Checked by DRP	Date 11/11/91		

FIELD BORING LOG				Boring No. BGM-91-02	
Project No. 06853-03		Project Name BANGER AAP		Page 1 of 1	
Contractor LAYNE		Driller G. RODRIGUEZ		Date started 11-5-91 completed 11-6-91	
Method DUAL WALL		Casing Size 9" O.D.		HNU 11.71102	
Ground El.		Soil Drilled 87'		Protection Level D	
		2' below ground 76.5		Total Depth 87'	
Logged by RRR		Checked by DRP		Date 11/11/91	

FIELD BORING LOG				Boring No. BGM-91-02	
Project No. 06853-03		Project Name BANGER AAP		Page 1 of 1	
Contractor LAYNE		Driller G. RODRIGUEZ		Date started 11-5-91 completed 11-6-91	
Method DUAL WALL		Casing Size 9" O.D.		HNU 11.71102	
Ground El.		Soil Drilled 87'		Protection Level D	
		2' below ground 76.5		Total Depth 87'	
Logged by RRR		Checked by DRP		Date 11/11/91	

FIELD BORING LOG				Boring No. BGM-91-02	
Project No. 06853-03		Project Name BANGER AAP		Page 1 of 1	
Contractor LAYNE		Driller G. RODRIGUEZ		Date started 11-5-91 completed 11-6-91	
Method DUAL WALL		Casing Size 9" O.D.		HNU 11.71102	
Ground El.		Soil Drilled 87'		Protection Level D	
		2' below ground 76.5		Total Depth 87'	
Logged by RRR		Checked by DRP		Date 11/11/91	

FIELD BORING LOG				Boring No. BGM-91-02	
Project No. 06853-03		Project Name BANGER AAP		Page 1 of 1	
Contractor LAYNE		Driller G. RODRIGUEZ		Date started 11-5-91 completed 11-6-91	
Method DUAL WALL		Casing Size 9" O.D.		HNU 11.71102	
Ground El.		Soil Drilled 87'		Protection Level D	
		2' below ground 76.5		Total Depth 87'	
Logged by RRR		Checked by DRP		Date 11/11/91	

FIELD BORING LOG			Boring No. BGM-91-02		
Project No. 06853-03		Project Name BANGER AAP		Page 1 of 1	
Contractor LAYNE		Driller G. RODRIGUEZ		Date started 11-5-91 completed 11-6-91	
Method DUAL WALL		Casing Size 9" O.D.		HNU 11.71102	
Ground El.		Soil Drilled 87'		Protection Level D	
Logged by RRR		Checked by DRP		Date 11/11/91	
				Total Depth 87'	

FIELD BORING LOG			Boring No. BGM-91-02	
Project No. 06853-03		Project Name BANGER AAP		Page 1 of 1
Contractor LAYNE		Driller G. RODRIGUEZ	Date started 11-5-91 completed 11-6-91	
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.71102	Protection Level D	
Ground El.	Soil Drilled 87'	± below ground 76.5	Total Depth 87'	
Logged by RRR	Checked by DRP	Date 11/11/91		

FIELD BORING LOG			Boring No. BGM-91-02		
Project No. 06853-03		Project Name BANGER AAP		Page 1 of 1	
Contractor LAYNE		Driller G. RODRIGUEZ		Date started 11-5-91 completed 11-6-91	
Method DUAL WALL		Casing Size 9" O.D.		HNU 11.71102	
Ground El.		Soil Drilled 87'		Protection Level D	
		2' below ground 76.5		Total Depth 87'	
Logged by RRR		Checked by DRP		Date 11/11/91	

FIELD BORING LOG			Boring No. BGM-91-02	
Project No. 06853-03		Project Name BANGER AAP		Page 1 of 1
Contractor LAYNE		Driller G. RODRIGUEZ	Date started 11-5-91 completed 11-6-91	
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.71102	Protection Level D	
Ground El.	Soil Drilled 87'	± below ground 76.5	Total Depth 87'	
Logged by RRR	Checked by DRP	Date 11/11/91		

FIELD BORING LOG			Boring No. BGM-91-02	
Project No. 06853-03		Project Name BANGER AAP		Page 1 of 1
Contractor LAYNE		Driller G. RODRIGUEZ	Date started 11-5-91 completed 11-6-91	
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.71102	Protection Level D	
Ground El.	Soil Drilled 87'	± below ground 76.5	Total Depth 87'	
Logged by RRR	Checked by DRP	Date 11/11/91		

FIELD BORING LOG			Boring No. BGM-91-02	
Project No. 06853-03		Project Name BANGER AAP		Page 1 of 1
Contractor LAYNE		Driller G. RODRIGUEZ	Date started 11-5-91 completed 11-6-91	
Method DUAL WALL	Casing Size 9" O.D.	HNU 11.71102	Protection Level D	
Ground El.	Soil Drilled 87'	± below ground 76.5	Total Depth 87'	
Logged by RRR	Checked by DRP	Date 11/11/91		

FIELD BORING LOG			Boring No. BGM-91-02		
Project No. 06853-03		Project Name BANGER AAP		Page 1 of 1	
Contractor LAYNE		Driller G. RODRIGUEZ		Date started 11-5-91 completed 11-6-91	
Method DUAL WALL		Casing Size 9" O.D.		HNU 11.71102	
Ground El.		Soil Drilled 87'		Protection Level D	
		2' below ground 76.5		Total Depth 87'	
Logged by RRR		Checked by DRP		Date 11/11/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-1	0-10'			BROWN CLAYEY SILT, COHESIVE, PLASTIC, TR C SAND TR F GRAVEL	(ML) 11-5-91 11-6-91	JAR	ATP
S-2	10-20'			LT BROWN-RED SAND, WGD M-C, LITTLE F, LITTLE F GRAV LITTLE SILT	(SW)		
SPOON #1	20-22'	7/11/14/19		SPOON #1	ANALYTICALS TAKEN 9:25 2 YRS 5 R-GR		
S-3	20-30'			LT BROWN SAND, WGD, M, SOME C, SOME F, TR F GRAV, TR SILT	(SW)		
S-4	30-40			SAME AS S-3	(SW)		
SPOON #2	40-42'	5/12/24/30		SPOON #2	ANALYTICALS 10/13		
S-5	40-50			SAME AS S-3	(SW)		
S-6	50-60'			SAME AS S-3	(SW)		
SPOON #3	60-62'	7/17/23/35		SPLIT SPOON #3	ANALYTICAL SAMPLES		
S-7	60-70'			LT BROWN SAND, PGD, M, SOME F, LITTLE C, TR SILT	(SP)		
S-8	70-80			LT BROWN SAND, PGD, M-C LITTLE F, TR SILT.	(SP) 76.5'		
S-9	80-87'			SAME AS S-8	(SP)		
				B.C.E. = 87'			

FIELD BORING LOG				Boring No. BCM-91-03	
Project No. 06853-03		Project Name BADGER AAP		Page 1 of 1	
Contractor LAYNE		Driller G. KOSALUK		Date started 11-7-91 completed 11-7-91	
Method DUAL WALL		Casing Size 9" O.D.		HNU 11.7102	
Ground El		Soil Drilled 100'		Protection Level D	
Logged by TCR		Checked by DRP		Date 11/11/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	PPM Monitoring	
						HNU	LEL
S-1	0-10'			LT BROWN-RED SAND, WGD M, SOME C, SOME F, SOME LITTLE SILT, LITTLE F GRAVEL	(SW)	JAR/AT	
S-2	10-20'			LT BROWN SAND, WGD, M-C SOME F GRAV, LITTLE C GRAV LITTLE F SAND, TR SILT, TR COBBLES.	(SW)		
SPoon #1	20-22'	43/12/19/22		SAME AS 20-30 (S-3) 21' BUS - 1" THICK CLAY LENS	ANALYTICAL SAMPLES 5 8-02, 2 VOA'S 11:10	4	0
S-3	20-30			LT BROWN SAND, WGD, M-C, LITTLE - SOME F GRAV, SOME F SAND, TR C GRAVEL.	(SW)		
S-4	30-40			SAME AS S-3	(SW)		
SPoon #2	40-42'	10/12/15/29		SAME AS S-5	ANALYTICALS 5 8-02 2 VOA'S 11:30		
S-5	40-50			LT BROWN SAND, MOD GD, M, SOME C, LITTLE F GRAV, TR BLACK CLAY PELLETS & (ORGANIC LOOKING CLAY)	(SW)		
S-6	50-60			LT BROWN SAND, PGD, M, SOME C, LITTLE F, TR F GRAVEL.	(SP)		
SPoon #3	60-62'	5/12/22/35		LT BROWN SAND, PGD, M-F LITTLE TO SOME SILT, SOME TO LITTLE M, TR C SAND.	ANALYTICALS 11:52 5 8-02, 2 VOA'S		
S-7	60-70			LT BROWN SANDS AND SILTY SANDS w/ INCREASE IN DEPTH PGD, F, TR M.	(SP)		
S-8	70-80			LT BROWN SILTY SAND, PGD, F, NON PLASTIC, NON COHESIVE.	(SP)		
S-9	80-90		80-81 81-84 84-90	SILTY SAND AS ABOVE CLAY, COHESIVE, BRITTLE, BROWN LT BROWN SILTY SAND AS ABOVE	(SP)		
S-10	90-100		90-95	LT BROWN SAND, PGD, F-M TR C	(SP)		

95-100' - LT BROWN GRAVELY SAND
WGD, SAND - M-C, LITTLE F
LITTLE SILT
GRAVEL - F, LITTLE C
TR C

(SW)

FIELD BORING LOG				Boring No. PB9101	
Project No. 685304		Project Name USATHAMA		BAAP	
Contractor MATHES		Driller T. CRANK		Page 1 of 4	
Method HSA 4 1/4"		Casing Size		Date started 10/11/91 completed 10/12/91	
Ground El.		Soil Drilled 104.5		HNH 11.7(102) #3	
Protection Level D		Total Depth 106.5			
Logged by SANDIN		Checked by DRP		Date 10/14/91	

	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
							HNH	LEL
243	S-1	0-2	2 3/4 4 7/8	2.0 1.8	dark brown sandy silt organic rich dense.	Reference Sample	JAR	ATP
250	S-2	2-4	2 3/4 4	2.0 1.3	dark brown sandy silty topsoil similar to S-1	Reference Sample		ATP
3	S-3	4-6	1 1/4 1/4	2.0 1.0	sample appeared to be topsoil with grass so rig was instructed to redrive spoon	Analytical Sample P9101006 P9101006 no sample		ATP
	S-3 2nd time	4-6	wt. of hammer	2.0 0.1	No recovery			
310	S-4	6-8	1 1/3 2	2.0 1.8	brown to black sandy silt with clay, 7-8 feet black asphalt chunks mixed with sandy silt	ANAL. SPLE P9101008 TIME ON SPLE ACTIVE STATE 10/13		ATP
1315	S-5	8-10		2.0 1.4	8-8.4 orange brn sandy silty clay	Reference Sample		ATP

FIELD BORING LOG				Boring No. P857101	
Project No. 685303		Project Name USATHAMA		BAAF	
Contractor MATHES		Driller T. CRANK		Page 2 of 4	
Method HSA		Casing Size —		Date started 10/11/91 completed 10/12/91	
Ground EL		Soil Drilled 104.5		HNU 11.7 (10.2) #3	
Protection Level D		Total Depth 106.5		2 below ground	
Logged by ES		Checked by DRP		Date 10/14/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
1325	10-12 WTR 16 6" S-6 23-37 -50 3"	10-12 feet 835	1.7	light brown sand fine to coarse with 30-40% rounded gravel, loose dry	Analytical Sample P9101012	JAR	ATP
	S-7 12-14	50/5"	0.4 0.2	sand and gravel loose refusal on cobbles	Reference Sample	ATP	ATP
1355	S-8 14-16	29/ 43 for 5 1/2"	1.5 1.5	tan silty gravelly sand, 40% gravel loose, dry	Analytical Sample P9101016	ATP	ATP
1405	S-9 16-18	47, 46 33, 33	2.0 1.8	tan gravelly sand loose, dry	Analytical Sample P9101018	ATP	ATP
1430	S-10 18-20	14, 24 27, 24	2.0 1.8	tan gravel sand becoming well sorted fine sand 19-20.	Reference Sample	ATP	ATP
1440	S-11 20-22	6, 30, 37, 25	2.0 2.0	TAN GRAVEL SAND BECOMING WELL SORTED FINE SAND, MOIST, DENSE, OUTWASH	ANALYTICAL SAMPLE P9101022	ATP	ATP
	S-12 24.5- 26.5	2-22 24-29	2.0 1.3	Tan Gravelly Sand moist, dense outwash	Reference Sample	ATP	ATP

FIELD BORING LOG				Boring No. PBB 9101	
Project No. 685203		Project Name USATAMA GAAP		Page 3 of 4	
Contractor MATHES		Driller T. CRANK		Date started 10/11/91 completed 10/12/91	
Method HSA		Casing Size —		HNU 11.7/10.2 #3 Protection Level D	
Ground El.		Soil Drilled 104.5		2' below ground Total Depth 106.5	
Logged by ES		Checked by DRP		Date 10/14/91	

	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
							HNU	LEL
500	S-13	29.5-31.5	15/84/ 25/35	2.0/ 2.0	tan sand fine well sorted moist tr gravel tr cse sd	Analytical Sample P9101031	JAR/ATP	
520	S-14	26.5 39.5-41.5	5/18/ 45/35	2.0/ 2.0	tan sand fine moist, well sorted	ANALYTICAL SAMPLE P9101041	ATP	
530	S-15	49.5-51.5	3/12 25/32	2.0/ 2.0	tan sand fine well sorted moist trace gravel	ANALYTICAL SAMPLE P9101051	ATP	
545	S-16	59.5-61.5	14/22/ 31/35	2.0/ 2.0	tan sand fine well sorted, no gravel moist	Analytical Sample P9101061	ATP	
610	S-17	69.5-71.5	8/50/ 4"	0.8/ 1.0	tan sand fine poorly graded with trace gravel	Analytical Sample P9101071	ATP	
625	S-18	71.5-81.5	50/5"	0.4/ 0.0	No Recovery	NO SAMPLE		
645	S-19	89.5-91.5	14/30/ 40/50 3"	1.6/ 1.8	tan sand fine poor graded very well sorted moist	Analytical Sample P9101091	ATP	
1710	S-20	99.5-101.5	14/50/ 5"		tr. gravel sand and gravel loose, rock fragments	Analytical Sample NOT TAKEN		

FIELD BORING LOG				Boring No. PB89101			
Project No 685303		Project Name USATNAMA BAAP			Page 4 of 4		
Contractor MATHEWS		Driller T. CRANE		Date started 10/11/91		completed 10/12/91	
Method HSA		Casing Size —		HNU 11.7 (102) #3		Protection Level D	
Ground El		Soil Drilled 104.5		# below ground		Total Depth 106.5	
Logged by E. S.		Checked by DRP		Date 10/14/91			

1730

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-21	104.5-106.5	18/18/ 15/22	2.0 2.0	light brown fine to coarse sand moderately well graded fine well sorted sand 106-106.5 saturated Bob augers 104.5 spoon 106.5	ANALYTICAL SAMPLE P9101105	JAR ATR	B/L

FIELD BORING LOG				Boring No. PBB-91-02	
Project No. 6853-03		Project Name BAAP		Page 1 of 4	
Contractor MATTHEWS		Driller Keith Bursell		Date started 10-11-91 completed 10-12-91	
Method HSA/Kmr 75		Casing Size 4.25"	HNU 11.7 (10.2)	Protection Level D	
Ground El		Soil Drilled 110'	± below ground 105'	Total Depth 110	
Logged by RHM		Checked by DRP		Date 10/14/91	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		SPC. SR.
							HNU	LEL	
15:12	S-1	0-2.5	3/4/6	1.5/1.3	Black Silty Clay; trace organic matl. and fine sand; top soil, dry. (CL)	Reference	JAR	ALR	BL
15:21	S-2 P912004	2-3.5	2/5/5	1.5/1.0	Brown mottled clay; little silt; trace fine sand; dry, soft, (C)	Analytical			
15:24	S-3	4-5.5	2/4/4	1.5/1.0	Brown to Black fine sand; little coarse sand and charcoal (fill); trace fine rounded gravel and silt; dry. (FILL) (SP)	Reference			
15:33	S-4	6-7.5	2/5/6	1.5/0	No Recovery	Stone/boulder blocked spoon			
15:40	S-5	8-9.5	2/3/4	1.5/NR	No Recovery	1st attempt no recovery - 2nd attempt split spoon with fill in same hole - adv. ranges to 10'			
15:47	S-6 P910012	10-12	8/22/25/42	2.0/15	Bottom 0.9' - Brown fine to coarse sand; little fine gravel, metal debris, fill; middle 0.9 - 1.2' - Black silty medium sand; trace medium gravel; wet; Top 1.2 - 1.5' - Brown medium to coarse sand; little fine gravel; wet. Spins, pellets wet like acetone (SW/FILL)	Driller having difficulty removing plug - an old nail was lodged between the plug and the inside of the HSA. 15 ppm at surface w/HNU Analytical			15C

FIELD BORING LOG				Boring No. PB3-91-07	
Project No. GS-53-03		Project Name BAAP		Page 2 of 4	
Contractor MATHEWS		Driller Keith Buxton		Date started 10-11-91 completed 10-12-91	
Method HSA/CME 75		Casing Size 4.25"	HNU 11.7 (10.2)	Protection Level ID	
Ground El		Soil Drilled 110'	8' below ground 2105	Total Depth 110'	
Logged by RBT		Checked by DRP		Date 10/14/91	

TIME	Sample No	Depth in Feet	Blows per 8 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		S. 17
							HNU	LEL	
16:12	S-7	12-14	50/45/40/47	2.0/ 1.6	Brown to tan fine to coarse sand; little fine to medium gravel; wet at top of spoon. (Fill) (GW)	50 ppm at auger head Reference	JAR	ATP	2.0
16:20	S-8	14-16	100 for 3"	3/0	No Recovery	FILL NATIVE		Bkg	2
16:31	S-9 P9102018	16-18	56/100	1.0/ 0.8	Tan fine sand; trace medium to fine gravel; dry (SP)	10 ppm at auger head - nothing in breathing zone The air smells sweet occasionally in breathing zone. Analytical	Bkg	Bkg	1.0
16:41	S-10 P9102020	18-20	12/18/14/29	2.0/ 1.5	Bottom 0.3' - Tan fine clayey fine sand and silt; silt; top 0.3 - 1.5' - Tan medium sand; little fine to medium angular gravel and fine sand; dry (SC/SW)	15 ppm at auger head Analytical	Bkg	Bkg	1.0
16:50	S-11 P9102022	20-22	16/16/23/37	2.0/ 2.0	Bottom 0.6' - Tan medium sand; little fine sand coarse sand; trace fine rounded gravel; middle 0.6 - 1.2' Tan silty fine sand; Top 1.2 - 2.0' - Tan to brown medium sand; some coarse sand; little fine rounded gravel and fine sand; dry (SP/SW/SW)	Analytical	Bkg	Bkg	1.0

FIELD BORING LOG				Boring No. <u>p33-91-02</u>	
Project No <u>6853-03</u>		Project Name <u>RTH</u>		Page <u>3</u> of <u>4</u>	
Contractor <u>M.A. TILLES</u>		Driller		Date started <u>10-11-91</u> completed <u>10-12-91</u>	
Method <u>HST/CME 75'</u>		Casing Size <u>4.25"</u>		HNU <u>11.7 (10.2)</u>	
Ground EL		Soil Drilled <u>110'</u>		Protection Level <u>D</u>	
				Total Depth <u>110'</u>	
Logged by <u>RTH</u>		Checked by <u>DRP</u>		Date <u>10/14/91</u>	

Time	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring			SPL	
							HNU	LEL			
17:00	S-12 P9102027	25-27	15/16/21/27	2.0/ 1.8	Bottom 1.4' - Tan medium sand; little fine sand; trace medium subrounded gravel; Top 1.4-1.8' Tan medium sand; trace coarse sand and fine subrounded gravel; dry. (SP)	Analytical	JAR	AIR	B ₂	B ₂	B ₂
17:15	S-13 P9102032	30-32	12/18/27/32	2.0/ 2.0	Tan medium sand; trace coarse sand and fine to medium subangular gravel; the sand is peppered with heavy minerals; dry (SP)	Analytical			B ₂	B ₂	B ₂
17:40	S-14	40-42	11/16/23/36	2.0/ 1.7	Tan medium and fine sand; trace coarse sand and medium angular gravel; dry Sample peppered w/ heavy minerals. (SP)	<u>RTH</u> Analytical Reference			B ₂	B ₂	B ₂
18:00	S-15 P9102052	50-52	14/23/29/36	2.0/ 2.0	Tan fine sand; trace medium sand and fine rounded gravel; dry (SP)	Analytical			B ₂	B ₂	B ₂
07:40	S-16 P9102062	60-62	14/17/22/36	2.0/ 2.0	10-12-91 Tan medium sand; some fine sand; trace medium subangular gravel and coarse sand; dry. (SP)	Analytical			B ₂	B ₂	B ₂

FIELD BORING LOG				Boring No. P3891	
Project No 6853-03		Project Name RAAP		Page 4 of 4	
Contractor MATHEIS		Driller Keith R. Schneider		Date started 10-11-91 completed 10-12-91	
Method HSA/Cmk 75		Casing Size 4.25"		HNU 11.71(10.2)	
Ground EL		Soil Drilled 110'		Protection Level D	
		2' below ground 2105		Total Depth 110'	
Logged by RHA		Checked by DRP		Date 10/14/91	

10-12-91

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		
							HNU	LEL	SPU
08:00	S-17 P9102072	70-72'	25/50/45/1.5	2.4/1.5	Tan to Brown medium Sand; Some coarse sand; little fine to medium regular to subrounded gravel; trace fine sand; dry (sw) peppered w/ heavy minerals	Analytical	JAR	ATR	
08:26	S-18 P9102072	80-82'	27/50/55/5	2.4/2.0	Tan to brown medium and coarse Sand; little fine to medium rounded to subangular gravel; sample peppered w/ heavy minerals; dry. (sw)	Analytical			
09:00	S-19 P9102072	90-92'	13/34/70/60	2.4/2.0	SAME AS ABOVE FROM 80-82' (sw)	Analytical			
09:30	S-20 P9102072	100-102'	27/49/59/60	2.2/2.0	SAME AS ABOVE (sw)	Analytical			
10:30	S-21 P9102112	110-112'	9/35/42/57	2.4/2.0	SAME AS ABOVE; <u>WET</u> (sw)	In water - 8' of heavy sand in core. <u>T.D. 110'</u>			

FIELD BORING LOG				Boring No. PBB9103	
Project No 685303		Project Name USATHAMA BAAB		Page 1 of 4	
Contractor MATHES		Driller T. CRANK		Date started 10-12-91 completed 10-12-91	
Method USA 4 1/4"		Casing Size ---		HNU 11.7(10.2) #3 Protection Level D	
Ground El. ---		Soil Drilled 99'		2 below ground Total Depth 101'	
Logged by ES.		Checked by DRP		Date 10/14/91	

TIME

	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
							HNU	LEL
	S-1	0-2	1-3-4-7	2.0 1.6	Dark brown sand silt with organics, plastic tags 0.6, black chips (asphalt?) SM	REFERENCE SAMPLE	JAR	ATR
1035	S-2	2-4	2-7-10-5	2.0 1.9	Dark brown organic rich sandy silty topsoil dense, Ash fragments SM	Analytical Sample P9103004	OK	S
1050	S-3	4-6	5-8-7-7	2.0 1.6	medium brown slightly sandy silt, moist, dense moderately plastic SM	Analytical Sample P9103006	OK	S
	S-4	6-8	3-7-8-15	2.0 1.2	medium brown sandy silt, moderately plastic. SM	Reference Saw	OK	S
	S-5	8-10	3-7-13-33	2.0 1.8	light brown sand fine to coarse with weathered fine gravel SW	Reference Sample	OK	S
120	S-6	10-12	50/50 5"	2.0 1.0	tan fine to coarse sand with 40% gravel loose, dry SW	ANALYTICAL SAMPLE P9103012	OK	S
	S-7	12-14	14-20-20-25	2.0 1.9	tan fine sand with 10% gravel and two sandy silt zones from 12.4-12.6 and 13.3-13.4 SP/SM	Reference Sample	OK	S

FIELD BORING LOG			Boring No. <u>P889102</u>	
Project No <u>685303</u>		Project Name <u>USATHAMA BARP</u>		Page <u>2</u> of <u>4</u>
Contractor <u>MATHES</u>		Driller <u>T. CRANK</u>		Date started <u>10-12-91</u> completed <u>10/12/91</u>
Method <u>HA 4 1/4"</u>	Casing Size <u> </u>	HNU <u>11.7(102) #3</u>	Protection Level <u>D</u>	
Ground El <u> </u>	Soil Drilled <u>99'</u>	<u>2</u> below ground		Total Depth <u>101'</u>
Logged by <u>R.S.</u>		Checked by <u>DRP</u>		Date <u>10/4/91</u>

	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
							HNU	LEL
1140	S-8	14-16	7-16- 20-27	2.0 1.9	14-19.4 tan sand v. fine well sorted, moist 14.4-14.8 tan sand well sorted, fine 14.8-15.9 tan sand fine-medium 15.1-15.9 light brown v.f. to fine sand well sorted SP	ANALYTICAL SAMPLE P9103016	JAR	ATR
1150	S-9	16-18	11-12 22-28 12-12- 28-28	2.0 1.15	tan fine sand well sorted base SP orange tan last 0.5 feet with weathered dolomite, dry	ANALYTICAL SAMPLE P9103018	JAR	ATR
	S-10	18-20	3-10- 16-27	2.0 1.7	tan fine sand with 10% gravel, loose slightly moist. SP	REFERENCE SAMPLE	JAR	ATR
1200	S-11	20-22	22-28- 27-31	2.0 2.0	tan sand fine with some med-coarse and 10% gravel. grey sand layer @ 20.3-20.35 coarser sand interval 20.7-20.8 SP	ANALYTICAL SAMPLE P9103022	JAR	ATR
	S-12	22-24	14-20 28-35	2.0 2.0	tan fine well sorted sand with coarser layer & coarse sand and fine gravel SP	Reference Sample	JAR	ATR

FIELD BORING LOG			Boring No. PB89103	
Project No. 6853 03		Project Name USATHAMA BAAP		Page 3 of 4
Contractor MATHEIS		Driller T. CRANK	Date started 10-12-91 completed 10/12/91	
Method HSA 4 1/2"	Casing Size —	MNU 11.7/102	Protection Level D	
Ground El.	Soil Drilled 99'	2' below ground	Total Depth 101'	
Logged by E.S.		Checked by JRP	Date 10/14/91	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
							MNU	LEL
	S-13	24-26	5-30 - 30-32	2.0 2.0	tan sand with multicolored gravel sand is predominantly fine with 5% med - quartz. SP/SW	Reference Sample	JAR	ATP
	S-14	26-28	12-33 - 35-40	2.0 1.8	tan sand and gravel similar to S-13 loose, slightly moist. SW	Reference Sample	ATP	ATP
	S-15	28-30	12-15 - 28-26	2.0 1.8	tan sand fine, well sorted with 5-10% rounded gravel, loose sl. moist. SP	Analytical Sample P9103030	ATP	ATP
320	S-16	39-41	5-15 - 30-48	2.0 2.0	tan sand very fine-fine, well sorted trace fine gravel disseminated throughout faint horizontal laminations slightly moist. SP	ANALYTICAL SAMPLE P9103041	ATP	ATP
1. 35	S-17	49-51	10-20 34-43	2.0 2.0	tan sand fine, well sorted 49.7-49.8 med - cse sand. 49.8-51 fine sand occasional faint laminae, to coarse sd laminations. SP	ANALYTICAL SAMPLE P9103051	ATP	ATP

FIELD BORING LOG				Boring No. PB89103	
Project No. 685303		Project Name USATHAMA BAAP		Page 4 of 4	
Contractor MATHES		Driller T. CRANK		Date started 10-12-91 completed 10/12/91	
Method HSA 4 1/2"		Casing Size —		HNU 11.7 (102) D	
Ground El		Soil Drilled 99'		2' below ground	
Total Depth 101'					
Logged by ES		Checked by DRP		Date 10/14/91	

	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
							HNU	LEL
1400	S-18	59-61	10-20-22-27	2.0 2.8	Sand tan fine 5% fine gravel occasional faint horiz laminations of coarser sand layering loose, slightly moist SP	ANALYTICAL SAMPLE P9103061	JAR	ATR
1415	S-19	69-71	17-33-40-42	2.0 1.5	Fine to coarse sand and gravel (50%) some of the gravel is weathered (dolomite?) and friable. loose, dry. SW	ANALYTICAL SAMPLE P9103071	QTC	
1435	S-20	79-81	22-23-23-25	2.0 1.6	Gravel with 40% fine to coarse rounded sand. SW	ANALYTICAL SAMPLE P9103081	QTC	
1505	S-21	89-91	43/50 5"	0.9 0.9	Gravel similar to S-20 SW	ANALYTICAL SAMPLE P9103091	QTC	
1530	S-22	99-101	7/16/20 20	2.0 1.4	Fine to coarse sand and gravel (40%) saturated SW WATER IN AUGERS AT 99.5 bgs BOB 99 AUGERS 101 LAST SPLIT SPOON	ANALYTICAL SAMPLE P9103101	QTC	

FIELD BORING LOG				Boring No. PBB-91-04	
Project No. 6853-03		Project Name BAAP		Page 1 of 5	
Contractor MATHEIS		Driller Keith Brunsell		Date started 10-13-91 completed 10-14-91	
Method HSH / CHL 75		Casing Size 4.75"		HNU 11.71 (10.2)	
Ground El.		Soil Drilled 105'		2' below ground 102'	
Logged by ZHA		Checked by DRP		Date 10/15/91	
				Total Depth 105'	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		Siz
							HNU	LEL	
13:30	S-1	0-2	4/5/6/9	2.0/ 1.0	Bottom 0.4' Brown fine sandy silt; trace organics;	Reference	JAR	ALR	71
13:34	S-2	3-4	4/5/7/7	2.0/ 1.1	Top 0.4' - 1.0' - Brown fine sand; little medium gravel; dry - top soil (SM)	Reference			
					Brown Clayey fine Sand (SC) (loess) dry.		Bk	Bk	71
38	S-3	4-6'	10/26/35/38	2.0/ 1.5	Bottom 1.1' - Brown fine sand; some medium sand; little coarse sand and fine to medium subrounded gravel (Fic?); Top 1.1 - 1.5 Brown sandy clay (loess) (SC) dry	Reference	Bk	Bk	71
13:51 9104008	S-4	6-8'	22/49/50/45	2.0/ 2.0	Brown fine to coarse sand; some fine to coarse gravel and rock frags.; trace green sand in middle of spore; dry (GW/Fic?)	Analytical	Bk	Bk	71
14:00	S-5	8-10	11/41/50/53	2.0/ 1.6	Brown fine to coarse sand; some fine to coarse gravel; broken rock frags.; black sooty material at top of spore; dry (GW/Fic?)	Reference	Bk	Bk	71

FIELD BORING LOG				Boring No. <u>PBB-91-114</u>	
Project No <u>6853-C3</u>		Project Name <u>BAAP</u>		Page <u>2</u> of <u>5</u>	
Contractor <u>MATHES</u>		Driller <u>Kerth B. Buehler</u>		Date started <u>10-13-91</u> completed <u>10-14-91</u>	
Method <u>HSA/CME 75</u>		Casing Size <u>4.25"</u>	HNU <u>11.71 (0.2)</u>	Protection Level <u>D</u>	
Ground El <u></u>		Soil Drilled <u>105'</u>	<u>2</u> below ground <u>102'</u>	Total Depth <u>105'</u>	
Logged by <u>RHA</u>		Checked by <u>DRP</u>		Date <u>10/15/91</u>	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
							HNU	LEL
14:11 P9104012	S-6 P910704	10-12	12/32/34/40	2.0/ 1.6	Brown to Tan fine to coarse sand; some fine to coarse gravel; dry (Gr/Fine?)	Analytical	JAR AIR	Bk Bk
14:25	S-7	12-14	7/8/16/18	2.0/ 2.0	Tan fine sand; trace medium and coarse sand; dry. (SP)	Reference		
14:30	S-8	14-16	5/12/12/16	2.0/ 1.7	Tan medium sand; little fine sand; trace coarse sand at bottom of spoon; thin bed of black silt sand in middle of spoon; dry (SP)	Reference	Bk	Bk
14:39 P9104018	S-9	16-18	8/12/17/22	2.0/ 1.8	Bottom 1.4' - Tan fine sand; trace coarse and medium sand and fine rounded gravel; Top 1.4' - 1.8' - Tan medium sand; some fine sand; little coarse sand; trace fine to medium gravel; dry (SP/SW)	Analytical	Bk	Bk
14:44	S-10	18-20	11/18/26/43	2.0/ 2.0	Tan to brown fine to coarse sand; little fine to medium rounded gravel; dry (SW)	Reference	Bk	Bk
14:55 P9104022	S-11	20-22	12/21/26/34	2.0/ 1.7	SAME AS ABOVE PENN 18-20 with rock frags. and HM, dry; trace black to green sand at bottom of spoon. (SW)	Analytical	Bk	Bk

FIELD BORING LOG				Boring No. 7BB-91-04	
Project No. 253-03		Project Name BAAP		Page 3 of 5	
Contractor NATHAN		Driller L. H. Bassline		Date started 10-13-91 completed 10-14-91	
Method H/A/KMA 75		Casing Size 4.25"		HNU 11.71(10.2)	
Ground EL		Soil Drilled 105'		2' below ground 102'	
Logged by R.H.H.		Checked by DRP		Date 10/15/91	
				Protection Level D	
				Total Depth 105'	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring			SPCL
							HNU	LEL	SPCL	
15:04	S-12	22-24	100/Refused	0.5/ 0.3	Tan medium sand; some fine sand; trace fine to medium sub rounded gravel; dry. (SP)	Reference	JAR/ATR	Bk	Bk	Bk
15:16 1104026	S-13	24-26	64/70/100	9.5/ 0.1	Tan medium sand; some fine sand; dry (SP)	Analytical collected VOCs only.	Bk	Bk	Bk	Bk
15:26 P#104028	S-14	26-28	16/18/14/20	2.4/ 2.0	Tan medium and fine sand; trace coarse and fine to medium gravel; black wet sandy seam near top of spoon and green sandy seam near bottom of spoon containing solvents. - 7 ppm (SP)	WATER Analytical VOC only	Bk	Bk	7.	
15:35	S-15	28-30	13/16/18/25	2.0/ 2.0	Tan medium sand; little fine sand; trace coarse sand; several fingers of green stained sand - 5 ppm; damp. (SP)	Reference	Bk	Bk	5.	
15:31 1104032	S-16	30-32	15/40/36/20	2.4/ 2.0	Tan fine to medium sand; trace coarse sand and large rounded gravel and H.M. green stained soil at top of spoon; dry. (SP)	20 ppm at auger head. Analytical Upper on Carbon Tetrachloride. Dragoon Tube. Volatiles collected from top of spoon	Bk	Bk	2.	

FIELD BORING LOG				Boring No. PBB-91-4	
Project No. 6453-03		Project Name B.1AP		Page 4 of 5	
Contractor B.1AP		Driller B.1AP		Date started 10-13-91 completed 10-14-91	
Method HWT/CAIR 7		Casing Size 4.25"		HNU 11.7 (10.2)	
Ground El.		Soil Drilled 105'		2' below ground/102'	
Logged by RHA		Checked by DRP		Date 10/15/91	
				Protection Level D	
				Total Depth 105'	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		S2
							HNU	LEL	
16:00 P9104042	S-17	40-42	18/18/30/30	2.0/ 2.0	Tan fine sand; trace med and coarse sand; dry (SP)	50 ppm at upper hand at 35' b.s. Analytical.	JAR	ALR	1.1
16:20 P9104052	S-18	50-52	16/20/22/32	2.0	Tan fine sand; little medium sand; trace coarse sand and fine to medium subrounded gravel. bands of green stained and throughout sample; dry. (SP)	Analytical	ALR	BLK	
16:35 P9104062	S-19	60-62	12/18/21/32		Tan fine sand; little medium sand; trace silty fine sand in thin lenses; green stained soil in bands throughout sample; dry - sample is aromatic - of chemicals (SP)	Analytical	ALR	BLK	8.
08:06 P9104072	S-20	70-72	16/21/41/75	2.0/ 2.0	Tan medium sand; little fine sand; trace coarse sand, and fine rounded gravel. Sample is stained green in many areas; dry in top portions, damp in stained area. (SP)	difficult drilling at 66' - cobble zone. Analytical	ALR	ALR	
08:38 P9104082	S-21	80-82	40/52/32/60	2.0/ 1.4	Brown to Tan fine to coarse sand; some fine to coarse angular to rounded gravel and rock frags; dry (GW)	Analytical	BLK	BLK	6.

FIELD BORING LOG				Boring No. PBB-91-07	
Project No. 6553-03		Project Name BAAP		Page 5 of 5	
Contractor MATTHEWS		Driller K. Bunselmeier		Date started 10-13-91 completed 10-14-91	
Method USA/10MRE 75	Casing Size 4.25	HNU 11.7 (102)	Protection Level D		
Ground El.	Soil Drilled 105'	2' below ground/102	Total Depth 105		
Logged by JPH		Checked by DRP		Date 10/15/91	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		Spec
							HNU	LEL	
08:55 79104092	S-22	90-92	5/21/19/2A	2.9 1.7	Bottom 1.1' - Tan fine and medium sand; trace coarse sand; Top 1.1-1.7' Tan medium sand; trace coarse sand and fine rounded gravel; dry. slight chemical odor, but no staining (SP)	Analytical	JAR	ALP	SP
09:20 79104102	S-23	100-102	43/40/31/18	2.5 2.0	Tan to Brown fine to coarse sand, some fine to medium gravel; dry (SW)	Analytical	AL	BL	BL
9:45 79104107	S-24	105-107	25/14/17/18	2.0 1.1	Brown fine to coarse sand; some fine gravel; trace medium gravel, wet. (SW)	Analytical sampled BTW at 102' in augers. P T.O. 105'	AL	BL	BL

FIELD BORING LOG				Boring No. PBB9105	
Project No 685303		Project Name USATNAMA GAAP		Page 1 of 5	
Contractor MATHES		Driller T. CRANK		Date started 10.14.91 completed 10.15.91	
Method HCA 4 1/4"		Casing Size		HNU 11.7(102) #3 Protection Level D	
Ground El		Soil Drilled 99		± below ground Total Depth 101	
Logged by ES/DL		Checked by DRP		Date 10/15/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-1	0-2	77/4/6	2.0 1.6	0-0.5 gray to brown silty gravelly sandy fill 0.5-1.6 dk brown to brown sandy silty topsoil slightly plastic, dense ML	Reference Sample	OK	OK
S-2	2-4	3/4/5/3	2.0 1.5	brown sandy silt dense slightly plastic ML	Reference Sample	OK	OK
1045 S-3	4-6	3/19/ 21/37	2.0 1.4	tan sandy gravel, loose cobble pieces, dry SW	ANALYTICAL SAMPLE P9105006	OK	OK
S-4	6-8	11/29/ 39/44	2.0 1.6	tan sand, fine to coarse, loose with 30% gravel, dry SW	Reference Sample	OK	OK
S-5	8-10	35/50 5"	0.9 0.9	tan sand and gravel similar to S-4 SW	Reference Sample	OK	OK
S-6	10-12	7/38/43 50 5"	1.9 1.4	tan sand and gravel similar to S-5 SW	Reference Sample	OK	OK
1120 S-7	12-14	28/40/50 5"	1.4 1.3	fine to coarse sand with 60% gravel loose, slightly moist GW	ANALYTICAL SAMPLE P9105014	5	OK
S-8	14-16	25/30/ 35/40	2.0 1.6	tan to light brown gravelly sand fine to coarse, cobble and gravel fragments, loose, dry SW	Reference Sample	OK	OK

FIELD BORING LOG				Boring No. PB89105	
Project No. 685303		Project Name USATHAMA BAP		Page 2 of 5	
Contractor MATHES		Driller T. CRANK		Date started 10-14-91 completed 10-15-91	
Method HSA 4 1/4"		Casing Size —		HNU 11.7(102) #3 Protection Level D	
Ground El		Soil Drilled 99		± below ground Total Depth 101	
Logged by ES		Checked by DRP		Date 10/15/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-9	16-18	19/38 40/43	2.0 1.5	tan to brown sand fine to coarse with 40% gravel SW	Reference Sample	OK	OK
S-10	18-20	6/12/18 21	2.0 1.6	tan sand Fine well sorted, trace coarse sand, fine gravel loose, slightly moist SW	Reference Sample	OK	OK
S-11	20-22	17/17/ 25/40	2.0 2.0	tan Fine sand well sorted moist occasional darker lamina and graybrown silt lamina. two areas of yellowish discoloration. slight odor. no tip response. SP	Reference Sample <div>Headspace Ref. Jar 3</div>	OK	OK
S-12	22-24	8/21 23/25	2.0 1.5	tan to light brown sandy gravel, loose no obvious discoloration slightly moist GW	Reference Sample	OK	OK
1350 S-13	24-26	8/16 25/50 5"	2.0 2.0	tan sand fine well sorted to fine-med well sorted 0-100% gravel loose, slightly moist. 24.6-25.0 mottled penny size gray discoloration slight yellowish tint to most of sample SP	ANALYTICAL SAMPLE P9105026 <div>Ret. Jar headspace 17 ppm</div>	5	OK

FIELD BORING LOG				Boring No. P88910	
Project No. 685303		Project Name USATHAMA GAAP		Page 3 of 5	
Contractor MATHES		Driller T. CRANK		Date started 10-14-91 completed 10-15-91	
Method HSA 4 1/4"		Casing Size —		HNU 11.7/102 #3	
Ground EL		Soil Drilled 99		Protection Level D	
		2 below ground		Total Depth 101	
Logged by E. SANDIN		Checked by DRP		Date 10/15/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
1405 S-14	26-28	4/28/ 38/33	2.0 1.6	tan gravelly sand fine to coarse with 40% gravel and rubble pieces. loose. moist SW	ANALYTICAL SAMPLE P9105028	3	OKS
S-15	28-30	21/19/ 30/36	2.0 1.8	tan-brown ss fine to medium sand with 20% fine rounded gravel slight yellowish tuff to sil. odor. slight moist appearance SW	Reference Sample <div>Jar headspace 6 ppm</div>	5	OKS
1430 S-16	30-32	25/29 32/40	2.0 2.0	sand tan to tan yellow fine well sorted to fine to coarse with gravel, loose. slightly moist, odor SP	ANALYTICAL SAMPLE P9105032	3	OKS
1440 S-17	39-41	4/13 25/33	2.0 1.9	sand tan, fine to coarse with 10-15% gravel. loose, moist SW	ANALYTICAL SAMPLE P9105041	1	OKS
1510 S-18	49-51	7/21 30/19	2.0 2.0	sand tan fine well sorted with horizontal yellowish laminations occasional zones of fine to coarse sand with gravel SP	ANALYTICAL SAMPLE P9105051	3	OKS

3000
ambient
9.9/10.2

FIELD BORING LOG				Boring No. PB89105	
Project No 685303		Project Name USATHAMA BAAP		Page 4 of 5	
Contractor MATHES		Driller T. CRANK		Date started 10.14.91 completed 10.15.91	
Method HSA 4 1/4"		Casing Size —		HNU 11.7(102) # 3 Protection Level D	
Ground El		Soil Drilled 99		2' below ground Total Depth 101	
Logged by E. SANDIN		Checked by DRP		Date 10/15/91	

	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
							HNU	LEL
1530	S-19	59-61	9/24/37 40	2.0 2.0	Sand, tan, very fine well sorted with frequent cardboard thin coarser lamina. no apparent discoloration dry appearance SP	Analytical Sample P9105061	OK	OK
1545	S-20	69-71	5/15 27/41	2.0 2.0	Sand, tan, very fine well sorted slightly moister than S-19. odor 2' from spoon SP	ANALYTICAL SAMPLE P9105071	OK	OK
1600	S-21	71-73	9/20 39/46	2.0 2.0	Sand, tan very fine similar to S-20 SP	ANAL. SAMPLE P9105073	OK	OK
1620	S-22	77-81	11/24/ 50 5"	1.4 0.3	Gravel loose with fine to coarse sand GW	ANAL. SAMPLE P9105081 voc's only due to poor recovery	OK	OK
1645	S-23	89-91	50 3"	0.2 0.2	spoon refusal due to gravel. GW	No Sample	OK	OK
1700	S-24	99-101	26/48/ 48/50 3"	1.7 1.7	tan sand, fine, very well sorted, trace small gravel, trace coarser lamina SP	ANALYTICAL SAMPLE P9105101	OK	OK

FIELD BORING LOG				Boring No. PB9105	
Project No. 685303		Project Name USATHAMA		BAP	
Contractor MATNES		Driller T. CRANK		Page 5 of 5	
Method HSA 4 1/4"		Casing Size —		HNU 11.71 (2) 23	
Ground El.		Soil Drilled 99		Protection Level D	
		2 below ground		Total Depth 101	
Logged by E. S.		Checked by DRP		Date 10/15/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
1745 S-25	109-111	12/20/ 37/37	2.0 2.0	Sand, tan, Fine to medium, trace coarse sand and gravel. wet SW	ANALYTICAL SAMPLE P9105111	5	5
				BOB 109 AUGERS 111 LAST SPLIT- SPOON			

FIELD BORING LOG				Boring No. PBB9106	
Project No 685203		Project Name BAAP		Page 1 of 4	
Contractor MATHES		Driller T. CRANK		Date started 10-13-91 completed 10-13-91	
Method HSA		Casing Size 4 1/4"		HNU 11.7 (10.2)	
Ground El		Soil Drilled 109'		Protection Level C	
		2' below ground		Total Depth 111'	
Logged by ES		Checked by DRP		Date 10/14/91	

Sample No	Depth in Feet	Blows per 5 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-1	0-2	1-7-7 6	2.0 1.0	Dark brown silty sandy topsoil with roots	REFERENCE SAMPLE	5 10	ATK
S-2	2-4	2/3/3/3	2.0 1.2	medium to dark brown silty sand with roots sm	Reference Sample	8	K
S-3	4-6	2/3/3/3	2.0 1.1	medium to dark brown silt and silty sand less root matter, dense slightly plastic sm	Analytical Sample P9106006	8	K
S-4	6-8	2/2/2/3	2.0 0.8	med brown sandy silt mod plastic moist sm	Reference Sample	8	K
S-5	8-10	2/5/8/17	2.0 0.9	8-8.4 brn sandy silt mod plastic moist 8.4-8.9 multicolored glass fragments sm	Reference Sample	5	
0933 S-6	10-12	17/19/ 19/26	2.0 1.8	Black sandy ash occasional glass fragments brown silty sand without ash in lower 0.4 of spoon	ANALYTICAL SAMPLE P9106012	70	

FIELD BORING LOG				Boring No. PBB91	
Project No. 685303		Project Name BAAP		Page 2 of 4	
Contractor MATHES		Driller T. CRANK		Date started 10-13-91 completed 10-13-91	
Method HSA		Casing Size 4 1/4"		HNU 11.7/10.2	
Ground El		Soil Drilled 109'		Protection Level C	
Logged by ES		Checked by DRP		Date 10/14/91	
				Total Depth 111'	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-7	12-14	12-33 50 3"	1.3 0.8	brown fine sand trace gravel, loose wet, SP	ANALYTICAL Sample P9106014	500	500
S-8	14-16	50/50 3"	0.8 1.0	yellow tan fine sand trace gravel trace black waste, glass, friable texture. moist in part. SP	ANALYTICAL SAMPLE P9106016 5 ppm 4" above cuttings pile	600	600
S-9	16-18	50 5"	0.45 0.1	sand similar to above SP	Reference Sample 170 ppm 2" above cuttings pile	180	180
S-10	18-20	11/32/ 50/50 5"	1.9 1.9	light brown sand fine to coarse moderately well graded to poorly graded fine sand. areas of slight gray discoloration loose, tr gravel SW/SP	Analytical Sample P9106020	500	500
S-11	20-22	14/39/ 50 5"	1.4 1.5	brown sand fine to medium mottled discoloration trace gravel SP	Reference Sample Analytical VOCs taken	800	800

1015

FIELD BORING LOG				Boring No. PBB 9106	
Project No. 685303		Project Name USATNAMA BAAP		Page 3 of 4	
Contractor MATHES		Driller T. CRANK		Date started 10-13-91 completed 10-13-91	
Method HSA 4 1/4"		Casing Size —		HNU 11.7 (10.2)	
Ground El.		Soil Drilled 109'		Protection Level C	
		2' below ground		Total Depth 111'	
Logged by E.S.		Checked by DRP		Date 10/14/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-12	24-26	13/30/ 50 5"	1.4 1.4	tan to light brown gravelly sand. Fine to coarse with rounded gravel. loose SW	ANALYTICAL SAMPLE P9106026	500	420
S-13	29-31	27-37- 40-35	2.0 2.0	brown gravelly sand 50% gravel. occasional grayish discoloration SP/SW	ANALYTICAL SAMPLE P9106031	550	450
S-14	39-41				50-100 ppm Methylene Chloride headspace ref. jar (dragger tube)		
S-14	39-41	9/24/ 57/36	2.0 2.0	brown sand SW fine to coarse with 30% rounded gravel loose, moist, grayish discolored appearance finer zones produce highest tip readings and appear wetter	ANALYTICAL SAMPLE P9106041	550	450
S-15	49-51	3/14/ 29/40	2.0 1.8	brown sand fine to medium well sorted frequent thin gray discolored lamina. wet oily appearance on grains SP	Analytical Sample P9106051	500	450

FIELD BORING LOG				Boring No. PB891	
Project No 685303		Project Name USATHAMA BAAP		Page 4 of 4	
Contractor MATHES		Driller T. CRANK		Date started 10-13-91 completed 10-13-91	
Method ASA 4 1/4"		Casing Size	HNU 11.7/102	Protection Level C	
Ground El		Soil Drilled 109'	± below ground	Total Depth 111'	
Logged by ES		Checked by DRP		Date 10/14/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-16	59-61	8/21 38/50	2.0 2.0	Sand fine well sorted moist slightly yellowish greenish brown coloration some paper to pencil width laminations. darker gray brown. SP	ANALYTICAL SAMPLE P9106061	OK	OK
S-17	69-71	12/22 32/40	2.0 2.0	Sand tan, very fine, well sorted, several greenish yellow lamina generally drier appearance trace coarse grains SP	ANALYTICAL SAMPLE P9106071	OK	OK
S-18	79-81	50 5"	0.4 0	No recovery cobble in shoe	No SAMPLE	—	—
S-19	89-91	—	2.0 2.0	Gravel, loose, rounded with 30% med to coarse sand. damp GW	Rocky Drilling ANALYTICAL SAMPLE P9106091	OK	OK
S-20	91-101	4/18/30 38	2.0 2.0	tan sand very fine-fine, well sorted SP loose, dry appearance	ANALYTICAL SAMPLE P9106101	OK	OK
S-21	101-111	12-13 17-20	2.0 1.6	Gravel with 20-30% coarse to fine sand loose, wet. GW	ANALYTICAL SAMPLE P9106111	OK	OK
				Bor 109' AUGERS 111' Last split spoon			

FIELD BORING LOG				Boring No. PBB-91-07	
Project No 6853-C3		Project Name BAAP		Page 1 of 4	
Contractor MATHES		Driller Keith Ransclawer		Date started 10-12-91 completed 10-13-91	
Method HST/CMR 75		Casing Size 4 25"		HNU 11.7/10.2	
Ground El		Soil Drilled 75'		Protection Level D	
		± below groundline		Total Depth 77'	
Logged by RH1		Checked by DRP		Date 10/14/91	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		S22
							HNU	LEL	
5:00	S-1	0-2	2/6/5/7	2.0/ 1.4	Bottom 0.9' - Brown silty clay; thin layer of ash, charcoal and glass at top; Top 0.9' - 1.4' - Silty fine sand, grassy; dry. Top soil (CL/SM)	Reference	JAR Bk	ATP Bk	Bk
15:07	S-2	2-4	4/5/10/11	2.0/ 1.3	Brown Silty Clay; trace coarse sand, stiff; dry. (CL)	Ref	Bk	Bk	Bk
10 79107006	S-3	4-6	5/13/20/26	2.0/ 1.6	Bottom 1.1' - Brown fine to coarse sand; some fine to medium gravel (GW/Fill) Top 1.1' - 1.6' - Brown silty clay; dry (Fill/CL); trace red fibrous matl.	(2nd) Analytical	Bk	Bk	Bk
15:18 79107008	S-4	6-8	21/40/52/50	2.0/	Brown fine to coarse sand; little fine to coarse rounded gravel; dry, fill, red fibrous (GW/Fill)	Analytical	Bk	Bk	Bk
5:26 79107010	S-5	8-10	12/45/100	1.4/ 1.0	SAME AS ABOVE FROM 6-8' (GW/Fill)	Analytical	Bk	Bk	Bk
5:34 79107012	S-6	10-12	30/100	0.75/ 0.75	SAME AS ABOVE (GW/Fill)	Analytical	Bk	Bk	Bk

FIELD BORING LOG				Boring No. PBB-9	
Project No. 6853-03		Project Name BAAP		Page 2 of 4	
Contractor MATHES		Driller Keith Bunkhaver		Date started 10-12-91 completed 10-13-91	
Method HSA / CME 75	Casing Size 4.25"	HNU 11.7 (102)	Protection Level D		
Ground El.	Soil Drilled 75'	± below ground line	Total Depth 86 77'		
Logged by ZHt		Checked by DRP		Date 10/14/91	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring			
							HNU	LEL	W2	S2
15:44	S-7	12-14	35/40/42/46		SAME AS FROM 10-12' (GW/FILL)	Reference	JAR			
15:53 P9107016	S-8	14-16	13/22/25/28	2.0/ 2.0	Bottom 1.4' - Tan fine Sand; little medium sand; trace fine to medium subrounded gravel; Top 1.4 - 2.0 - Brown fine to coarse sand; little fine to medium gravel; dry (SP/FILL/SW)	Analytical FILL ? 15' NATIVE	B ₂	B ₂	B ₂	B ₂
16:00	S-9	16-18'	10/21/24/27	2.0/ 2.0	Tan fine sand; some medium sand; trace coarse sand; dry (SP)	Reference	B ₂	B ₂	B ₂	
16:11 P9107020	S-10	18-20	9/11/21/22	2.0/ 2.0	Tan fine Sand; some medium sand; trace coarse sand and fine gravel; dry (SP)	Analytical	B ₂	B ₂	B ₂	
16:17	S-11	20-22	7/14/24/31	2.0/ 2.0	Tan medium Sand; some fine sand; little coarse sand; trace fine rounded gravel, peppered w/ heavy minerals, dry. (SW)	Reference	B ₂	B ₂	B ₂	

FIELD BORING LOG				Boring No. PBB-91-07	
Project No. 6853-03		Project Name BAAP		Page 3 of 4	
Contractor MATHELS		Driller Keith Burchmeyer		Date started 10-12-91 completed 10-13-91	
Method HSA/KMR 75		Casing Size 4.25"		HNU 11.7K(10.2)	
Ground El.		Soil Drilled 75'		2' below ground (None)	
Logged by RHH		Checked by DRP		Date 10/14/91	
				Total Depth 86' 77'	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring			Size
							HNU	LEL		
16:25	S-12	22-24	16/46/50	2.4/2.0	Tan medium sand; some coarse sand; little fine sand and fine to coarse gravel; dry (SW)	Reference	JAR	JAR		Size
16:35 1107026	S-13	24-26	24/48/100	2.4/2.0	Tan medium sand; some coarse and fine sand; trace coarse sand and fine to coarse angular to sub rounded gravel; dry rock fragments (SW)	Analytical	R2	R2	Bk2	Bk2
16:50	S-14	26-28	7/27/50	2.4/1.7	SAME AS ABOVE FROM 24-26'; dry. (SW)	Reference	R2	R2	Bk2	Bk2
17:00	S-15	28-30	7/20/22/46	2.0/2.0	Bottom 0.8' - Tan fine sand; trace medium sand, Top 0.8' - 2.0' - Tan medium sand; some fine and coarse sand; trace fine to coarse subangular gravel; dry. (SP/SW)	Reference	R2	R2	Bk2	Bk2
17:06 9107032	S-16	30-32	18/30/50/68	2.4/2.0	Tan medium sand; little fine sand and coarse sand; trace fine to coarse sub-rounded, gravel and rock fragments, sample reported w/HM (heavy minerals); dry. (SW)	Analytical	R2	R2	Bk2	Bk2

FIELD BORING LOG				Boring No. PBB-91-07	
Project No. 6853-03		Project Name BAAP		Page 4 of 4	
Contractor MATHES		Driller Keith Benschneider		Date started 10-12-91 completed 10-13-91	
Method HSA/LME 75		Casing Size 4.25"	HNU 11.7(102)	Protection Level D	
Ground El.		Soil Drilled 75'	2' below ground	Total Depth 77'	
Logged by RLL		Checked by DRP		Date 10/14/91	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
							HNU	LEL
17:24 P9107042	S-17	40-42	24/35/45/56	2.4/ 2.0	Tan medium Sand; little fine sand; trace coarse sand and fine to medium sub rounded, gravel and rock fragments; dry, approx with HM. (SP)	Analytical	JAR B ₂	ATM B ₂ 34 ₂
08:30 P9107052	S-18	50-52	25/32/36/59	2.4/ 2.0	10-13-91 Tan medium Sand; little fine sand; trace coarse sand and fine rounded gravel and HM; dry (SP)	Analytical	B ₂	B ₂ B ₂ B ₂ B ₂
08:50 P9107062	S-19	60-62	22/35/45/50	2.4/ 2.0	Tan medium and fine Sand; trace coarse Sand, fine rounded gravel and HM; dry (SP)	Analytical	B ₂	B ₂ B ₂ B ₂ B ₂
09:20 P9107072	S-20	70-72	20/40/52/104	2.4/ 2.0	Tan fine Sand; trace medium and coarse sand; dry. (SP)	Analytical cobbles at 73' Auger refused at 75'	B ₂	B ₂ B ₂ B ₂ B ₂
10:50 P9107082	S-21	75-77 80-82	64/100	0.6/ 0.5	Tan fine to coarse Sand; some fine to coarse gravel and rock fragments (sandstone; gabbro) dry. (GW)	Analytical T.D. 75'	B ₂	B ₂ B ₂ B ₂ B ₂

FIELD BORING LOG

BORING NO. *PB13-99-01*

PROJECT NO.: *6296-11* PROJECT NAME: *USATHAMA-BAAPFS* PAGE *1* OF *2*
 DRILLING CONTRACTOR: *LAYNE SOUTHWEST* DRILLER: *G Rodriguez* DATE STARTED *8/22/90* COMPLETED *8/23/90*
 METHOD: *DUAL WALL* CASING SIZE: *9 IN.* TIP # *TE#2* PROTECTION LEVEL: *D*
 GROUND ELEV.: SOIL DRILLED: *101.5* WATER LEVEL: *NA* TOTAL DEPTH: *101.5*
 LOGGED BY: *Buss* CHECKED BY: *P Bolner* DATE: *9/25/90*

Tip = 0.1 - 0.3 sec

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
						TIP	SEL
S#1	0-1.5	3	14"	black topsoil 0-0.5 ft	Sill	bkgd	
		5	15"	fin-med silty SAND SM 0.5/15			
S#2	5-6.5	7	17"	Tan fine silty Sand 6.0-6.5	Sill	bkgd	
		14	13"	light brn Med fin Sand 6.5-7.5			
		18		gabbro (rotten) at 6.5 small red mat at 6.0 crse angular gravel at 6.5 ft silt balls Sill			
S#3	10-11.5	17	15"	crse gravel 10-10.5	Sill	bkgd	
		27	17"	med. fin + crse Sand 10.5-11.5			
		22		with fin gravel 11-11.5 likely Sill.			
S#4	15-16.5	7	17"	crse-med SAND with some fin	Sill	bkgd	
		20	15"	sand + crse gravel. some			
		28		"orange, burnt orange material"	change at 20'		
S#5	20-22.5	4	18"	Tan Med SAND tree crse		bkgd	
		8	15"	sand + gravel v. clean some possible burnt orange material. (S) sp			
S#6	25-26.5	6		Tan med fin SAND w/			
		15		crse sand zone at 26 ft.			
		25		stratified native soil. sp			

FIELD BORING LOG

BORING NO. *PBR-70-01*

PROJECT NO.: 6298-11

PROJECT NAME: USATHANA- BAAP FS

PAGE *2* OF *2*

DRILLING CONTRACTOR: LAYNE SOUTHWEST

DRILLER: *G Rodriguez*

DATE STARTED *8/22/90* COMPLETED *8/23/90*

METHOD: DUAL WALL

CASING SIZE: 9 IN.

TIP WT: *TE #2*

PROTECTION LEVEL: *D*

GROUND ELEV.:

SOIL DRILLED: *101.5*

WATER LEVEL: *NA*

TOTAL DEPTH: *101.5'*

LOGGED BY: *J Buss*

CHECKED BY: *P. Bolner*

DATE: *9/25/90*

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
<i>S#7</i>	<i>45-46.5</i>	<i>5</i> <i>16</i> <i>25</i>	<i>18"</i> <i>17"</i>	<i>Tan Med. fn SAND at 46-46.5 ft. sampled for VOA, SVWA (SP)</i> <i>coarse gravel/cobble zone at 55-69 ft. 65 ft sample moved to 70 ft.</i>		<i>bkgd.</i>	
<i>S#8</i>	<i>70-71.5</i>	<i>13</i> <i>35</i> <i>25</i>	<i>18"</i> <i>10"</i>				
<i>S#8</i>	<i>70-71.5</i>	<i>13</i> <i>35</i> <i>25</i>	<i>18"</i> <i>10"</i>	<i>Coarse Gravel with Med to crse SAND. (SP-GP)</i>		<i>bkgd.</i>	
<i>S#9</i>	<i>85-86.5</i>	<i>4</i> <i>15</i> <i>16</i>	<i>18"</i> <i>18"</i>	<i>Tan med-fn SAND w/ crse sand at 85 and 86-86.5 ft (SP) Moist. wet at 100 ft.</i>		<i>bkgd.</i>	
<i>S#10</i>	<i>100-101.5</i>	<i>3</i> <i>6</i> <i>7</i>	<i>18"</i> <i>10"</i>	<i>Tan crse-fn SAND + fine grave SP.</i>		<i>bkgd.</i>	

FIELD BORING LOG

BORING NO. *PBB-90-02*

NO.: 0290-11	PROJECT NAME: USATHANA- BAAP FS	PAGE 1 OF 2
DRAWING CONTRACTOR: LAYNE SOUTHWEST	DRILLER: G. Rodriguez	DATE STARTED 8/23 COMPLETED 8/23/90
THOD: DUAL WALL	CASING SIZE: 9 IN	TIP W: TE #2 PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 96.5'	WATER LEVEL: 197.5' TOTAL DEPTH: 96.5'
LOGGED BY: J Buss	CHECKED BY: P Bolmer	DATE: 9/25/90

TE Bkgd = 0.0 - 0.3 ppm

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
						TIP	LEL
5#1	0-1.5	4 8 18	18/18	black topsoil over brown silt + clay w/ little black asphalt-like waste at 0.5'			bkgd
5#2	5-6.5	8 10 14	18/18	light brown silty fn-med SAND becoming cleaner at 6-6.5 ft. some dark red to purple waste maybe possible rock? some gravel at 5-5.5 ft.	NO WASTE		bkgd
5#3	10-11.5	13 50 12"	60/80	fn-crse SAND with gravel some redish brown silty fn SAND, waste?	Fill		bkgd
5#4	15-16.5	5 14 21	18/18	clean med SAND 15-16.5 ft crse SAND + gravel 16-16.5 ft some dark brown streaks. possible nat. soil	Native Soil.		bkgd
5#5	20-21.5	5 14 18	18/18	tan med-crse SAND w/ fn gravel stratified SP			bkgd
5#6	25-26.5	5 13 20	18/18	Tan med fn SAND trace crse SAND, gravel + silt.			bkgd

FIELD BORING LOG				BORING NO. 70B-90-02	
PROJECT NO.: 0290-11		PROJECT NAME: USATHAMA- BAAPFS		PAGE 2 OF 2	
DRILLING CONTRACTOR: LAYNE SOUTHWEST		DRILLER: G Rodriguez		DATE STARTED 8/23/90 COMPLETED 8/23/90	
METHOD: DUAL WALL		CASING SIZE: 9 IN		TIP #: TE #2 PROTECTION LEVEL: D	
GROUND ELEV.:		SOIL DRILLED: 96.5'		WATER LEVEL: ~97.5' TOTAL DEPTH: 96.5'	
LOGGED BY: J Bliss		CHECKED BY: P Belmer		DATE: 9/25/90	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S#7	45-46.5	5, 13, 20	18"	Stratified Med Fm SAND with occasional coarse sand moist v. clear bedding. SM-SP coarse gravel/cobble zone at 60 to 65 ft.			bkgd
S#8	65-66.5	17, 18	18"	COARSE SAND and gravel some gabbro SP-GP coarse gravel/cobble zone at 80-83 ft.			bkgd.
S#9	85-86.5	4, 8, 31	18"	Tan Med Fm SAND. No silt trace gravel moist to v. moist. coarser mat. at 85-85.5 ft (SP)			bkgd
S#10	95-96.5	3, 3, 9	18"	Tan Med-coarse SAND w/ some gravel. (SP)	V = 95 ft		
				95 ft BOE			

FIELD BORING LOG

BORING NO. PBB8901

PROJECT NO.: 5753-

PROJECT NAME: USATHAMA-BAAP

PAGE 1 OF 3

DRILLING CONTRACTOR: LAYNE-NORTHWEST

DRILLER: Rodney Parr

DATE STARTED 1/22/89

COMPLETED 1/23/89

METHOD: HSA

CASING SIZE: 4.25" 10

TIP EV: # 7

PROTECTION LEVEL: C Dermot

GROUND ELEV.: 875.5'

SOIL DRILLED: 102'

WATER LEVEL:

TOTAL DEPTH: 102'

LOGGED BY: PLB

CHECKED BY: JFR

DATE: 2/27/89

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
						TIP	CEL
S-1	0-2'	50-47-18-20	$\frac{20}{1.6}$	0-.4 organic .4-1.6 dk Tan clay, moderately plastic, stiff damp (CH)	Ref Plastic liner at 1.1	Bkg	
S-2	2-4'	14-12-10-10	$\frac{2.0}{.7}$	Bl silty clay, moderately plastic, firm damp (CL)	Ref	Bkg	
S-3	4-6'	2-4-6-9	$\frac{2.0}{1.2}$	dk brown to bl clay, little silt, plastic Soft, damp, w/ some charred layers (CH)	Took Analytical	Bkg	
S-4	6-8'	26-17-12-18	$\frac{2.0}{1.1}$	dk dense clay, w/ tr silt Tr Fi to med sa, moderately plastic, firm, damp (CL)	offset and danger down due to cobble layer and took sample on 1/23/89 Ref	Bkg	
S-5	8-10'	22-58-94-100	$\frac{1.8}{.2}$	Tan gr w/ some med sa, well graded, loose dry (GW)	rock clogged shoe ref ✓ change @ 8.0'	Bkg	
S-6	10-12'	90-100	$\frac{.9}{.7}$	Tan gr w/ some med to fi sa, well graded, dense, dry (GW)	Took Analytical Cobble zone & 11.0 (Native)	Bkg	
S-7	12-14'	50-115-100	$\frac{1.3}{.8}$	Tan med to fi sa, Tr c, w/ little Fi gr, Tr c gr, poorly graded, very dense, dry (SP)	✓ change @ 11.0'	Bkg	
S-8	14-16'	100	$\frac{.3}{.1}$	Tan c to fi gr w/ little med to fi sa, poorly graded, dense, damp (GP)	Ref - also Taken on 1/23 in offset boring	Bkg	

FIELD BORING LOG

BORING NO. PB88901

PROJECT NO.: 5753-08

PROJECT NAME: USATHAMA- 3AAP

PAGE 2 OF 3

DRILLING CONTRACTOR: LAYNE-NORTHWEST

DRILLER: Rodney Parr

DATE STARTED

1/22/89

COMPLETED

1/23/89

METHOD: HSA

CASING SIZE:

4.25" 10

TIP #:

10

PROTECTION LEVEL:

C Deerma

GROUND ELEV.:

875.5

SOIL DRILLED:

102'

WATER LEVEL:

TOTAL DEPTH:

102'

LOGGED BY:

FLB

CHECKED BY:

J.P. 2/27/89

DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	CEL
S-9	16-18'	32- $\frac{100}{0.4}$	$\frac{0.9}{0.6}$	As above	Took Analytical	Bkg	
S-10	18-20'	$\frac{100}{0.3}$	$\frac{0.3}{0.0}$	No recovery - rock clogged in shoe	Also taken on 1/23 in offset boring		
S-11	20-22'	$\frac{100}{0.4}$	$\frac{0.4}{0.1}$	Tan med to Fi sa, w/ some Fi gr, Tr c gr, poorly graded, dense, dry (SP)	Ref	Bkg	
S-12	25-27'	$\frac{100}{0.2}$	$\frac{0.2}{0.0}$	No recovery	Ref	Bkg	
S-13	30-32'	$\frac{100}{0.3}$	$\frac{0.3}{0.1}$	Rock clogged in shoe (sandstone)	Ref		
S-14	31-33'	24-39-44-90	$\frac{2.0}{1.8}$	Tan gravelly sa, med to Fi sa, w/ little Fi gr and some cgr, compact, poorly graded, moist (SP)	Took Analytical specimen appeared to be a good representation of the actual lithology	Bkg	
S-15	40-42'	15-33-34-52	$\frac{2.0}{1.7}$	Tan, med to Fi sa, Tr c, Tr Fi gr and Tr cgr, poorly graded, compact, moist, some stratification (SP)	Took Analytical	Bkg	
S-16	50-52'	15-33-48-55	$\frac{2.0}{1.7}$	Tan med to Fi sa, poorly graded, compact, moist .5 coarse sa lens	Took Analytical	Bkg	

FIELD BORING LOG

BORING NO. PBB8901

PROJECT NO.: 5753-08

PROJECT NAME: USATHAMA- BAAP

PAGE 3 OF 3

DRILLING CONTRACTOR: LAYNE-NORTHWEST

DRILLER: Rodney Parr

DATE STARTED 1/22/89 COMPLETED 1/23/89

METHOD: HSA

CASING SIZE: 4.75" ID

TIP SV: # 10

PROTECTION LEVEL: C Normal

GROUND ELEV.: 875.5'

SOIL DRILLED: 102'

WATER LEVEL:

TOTAL DEPTH: 102'

LOGGED BY: FLB

CHECKED BY: JEP. 2/27/89 DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-17	60-62'	24-36-36-41	$\frac{2.0}{1.8}$	Tan med to Fi sa, Tr c, Tr Fi gr, poorly graded, damp, compact 0.8 coarse sa lens SP	Took Analytical	Bkg	
S-18	70-72'	13-75- 100 3	$\frac{1.4}{12}$	SAND, TAN, F TO ^{TR} ED C, F TO C GRAVEL CONTACT AT 1.0', COMPACT TO DENSE, DAMP SP	ANALYTICAL	Bkg	
19	80-82'	33-77-71-88	$\frac{2.0}{2.0}$	Tan, gravelly sa, Fi to med ^{some} sa, w/ little Fi gr and some c gr, very dense, damp, well graded (Till)(SW)	COBBLE ZONE FROM 72 TO 78 FEET. Took Analytical	Bkg	
S-20	90-92'	19-75-95 100 4	$\frac{1.9}{1.6}$	0-11 Tan Fi to med sa, poorly graded, compact, damp (SP) 11-16 Ok tan gravelly sand, Fi to med sa, little c sa, w/ Fi To c gr, well graded, very dense, moist (SW)	29' sand till contact Took Analytical	Bkg	
S-21	100-102'	24-39-28-21	$\frac{2.0}{1.4}$	Tan (varied colors) gravelly sa, Fi to med sa, Tr Fi, w/ little Fi gr and some c gr, compact, damp to saturated at bottom of spoon (SW)	Took Analytical used 1700 gal of Grout	Bkg	

FIELD BORING LOG

BORING NO. PB38902

PROJECT NO.: 5753-

PROJECT NAME: USATHAMA- BAAP

PAGE 1 OF 4

DRILLING CONTRACTOR: LAYNE-NORTHWEST

DRILLER: Rodney Parr

DATE STARTED

1/24/89 COMPLETED 1/25/89

METHOD: HSA

CASING SIZE: 4.25" ID

TIP cv: #10

PROTECTION LEVEL: C Dermal

GROUND ELEV.: .873.8

SOIL DRILLED: 105'

WATER LEVEL: 100' ±

TOTAL DEPTH: 105'

LOGGED BY: PLB

CHECKED BY: SFT 2/27/89 DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-1	0-2'	30-50-39-22	2.0 1.5	Clay 0-.85 - Dk br silty clay (Fill) mod plastic, stiff (Frozen) w/ organic pieces prairie grass and some charcoal pieces .85-1.5 - Dk olive clay, moderately plastic, stiff, some charcoal pieces (ant)	.85 - plastic liner Ref (Fill)	Bkg	
S-2	2-4'	20-20-18-15	2.0 2.0	0-1.0 - Clay - Dk olive, moderately plastic, stiff and some charcoal pieces 1.0-2.0 Silty/sand, olive + tan silt w/ very fine sand, Non plastic, soft, damp (SM)	Wrong liner or log (ends at ~3') Ref (Fill)	Bkg	
S-3	4-6'	10-38-16-10	2.0 0.8	Silty clay - Dk clay w/ little silt, moderately plastic, stiff, damp - wood pieces at the shoe (CL)	Anal (Fill)	Bkg	
S-4	6-8'	10-12-12-12	2.0 0.2	Sand → Dk Ft to med sand, little clay, well graded, loose, damp metal scrap in spoon, also some wood debris, slight sweet shell. (SW)	Anal - not much sample to work with (Fill)	4.8	
S-5	8-10	11-100-13	0.8 2.0 0.2	As above w/ more in c had nails in spoon	Anal 28.5' Augers have lot of chatter (Fill)	2.8	

FIELD BORING LOG

BORING NO. PBB-5902

PROJECT NO.: 5753-

PROJECT NAME: USATHAMA- BAAP

PAGE 2 OF 4

DRILLING CONTRACTOR: LAYNE-NORTHWEST

DRILLER: Rodney Parr

DATE STARTED 1/24/59

COMPLETED 1/25/59

METHOD: HSA

CASING SIZE: 4.25" 10

TIP cv: 10

PROTECTION LEVEL: C Dermal

GROUND ELEV.: 873.8

SOIL DRILLED: 105'

WATER LEVEL: 100'±

TOTAL DEPTH: 105'

LOGGED BY: PLB

CHECKED BY: JSP 2/24/59 DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-6	10-12'	95-100 0.2	0.7 0.2	Sand Dk br Fi to med sa Some c, well graded, compact, damp (SW)	Anal (F:11)	Bkg	
S-7	12-14'	48-100-100 0.25	1.4 0.6	Sand Dk tan med to Fi sa, Tr c, Tr Figr, tr cgr, poorly graded, dense, damp (SP)	Ref	Bkg	
S-8	14-16'	60-67-91-40	2.0 2.0	Sand Tan c + Fi sa, little Tr Figr, tr cgr Very Fi sa poorly graded, dense, damp. (SP)	≈ 14.2 bottom of pit (change) Anal 0-2 Dk tan	Bkg	2-14.2'
S-9	16-18'	23-30-30-50	2.0 2.0	Sand Tan Fi to very fi sa, Tr c, poorly graded, compact to dense, damp, silt partings 0.1-0.4 (SP)	Anal - BVA		
S-10	18-20	19-31-35-33	2.0 2.0	LAYERED SILT AND SAND TO SILT, NONPLASTIC, LT BROWN SILT w/ FINE SAND, TR M-C TO A FINE SILT, DAMP, CONTACT AT 1.5 SP/ML	ANALYTICAL NAM	3.0	
S-11	25-27	14-26-28-17	2.0 2.0	SAND, TAN P GRADED VERY FINE TO TR MED SA, 0.2 C SA - FGRV LAYER, OCCASIONAL SILT PARTICLES COMPACT, DAMP SP	ANALYTICAL	0.8	

FIELD BORING LOG				BORING NO. PBB-8902	
PROJECT NO.: 5753-08		PROJECT NAME: USATHAMA-BAAP		PAGE 3 OF 4	
DRILLING CONTRACTOR: LAYNE-NORTHWEST		DRILLER: Rodney Parr		DATE STARTED: 1/24/89	COMPLETED: 1/25/89
METHOD: 153	CASING SIZE: 4.25" ID	TIP: #10	PROTECTION LEVEL: C Dermal		
GROUND ELEV.: 873.8	SOIL DRILLED: 105'	WATER LEVEL:	TOTAL DEPTH: 105'		
LOGGED BY: PLB		CHECKED BY: JEP 2/27/89		DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-12	30-32'	25.36-50-69	2.0 1.7	Sand 0-.6 DK Tan med to Fi sa u/ Some c well graded, dense to very dense damp (SW) .6-1.4 ^{Tan} med to Fi sa, poorly graded, dense to very dense, damp 1.4-1.7 - as s-.6 (SP)	Took Anat	1.2	
S-13	40-42'	14.26-41-50	2.0 1.6	Sand Tan med to Fi sa, Tr sa, Tr Fi gr, poorly graded, dense, damp, well stratified w/ silt partings throughout (SP)	Took Anat	1.3	
S-14	50-52	21.48-46-94	2.0 1.7	Sand med to Fi sa, Tr c, poorly graded, dense to very dense, damp, c sa lenses at 1.0, 1.2, 1.5, well stratified (SP)	Anat	1.2	
S-15	60-62'	20.48-77-	2.0 1.9	Sand med to Fi sa, Tr c, poorly graded, very dense, damp, well stratified, med sand lens at 1.5 (SP)	Anat	Bkg	
S-16	70-72'	42.72-100-12	1.8 0.9	Gravelly Sand, med to Fi sa, Tr c Tr c sa, w/ some Fi to c gravel well graded, very dense, damp (GP)	Anat Change @ 70.0'	as	

FIELD BORING LOG

BORING NO. PB58902

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- SAAP	PAGE 4 OF 4
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: Rodney Parr	DATE STARTED 1/24 COMPLETED 1/25/89
METHOD: HSA	CASING SIZE: 4.25" 10	TIP cv: #10 PROTECTION LEVEL: C Dermal
GROUND ELEV.: 873.8	SOIL DRILLED: 105'	WATER LEVEL: 100' TOTAL DEPTH: 108'
LOGGED BY: PLB	CHECKED BY: 2/20/89 JER	DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-17	80-83'	37-61-92- $\frac{100}{0.4}$	$\frac{1.9}{1.9}$	Gravelly sand - Dk Tan to br Fi to red sa w/ some c, very well ^{po} graded, comp very dense, moist (GW)	Analytical	1.8	
S-18	90-92'	38-47-73 $\frac{100}{0.4}$	$\frac{1.9}{1.6}$	As above	Ref	BK	
-19	100-102	11-10-11-12 $\frac{2.0}{1.0}$		As above but saturated BOB @ 105'	Anal	BK	

FIELD BORING LOG				BORING NO. ABB8903	
PROJECT NO.: 5753-08		PROJECT NAME: USATHAMA-BAAP		PAGE 1 OF 4	
DRILLING CONTRACTOR: LAYNE-NORTHWEST		DRILLER: Rodney Parr		DATE STARTED 1/31/89 COMPLETED 2/1/89	
METHOD: HSA	CASING SIZE: 4.25" 10	TIP cv: 15		PROTECTION LEVEL: c Dermal	
GROUND ELEV.: 868.2	SOIL DRILLED: 100'	WATER LEVEL:		TOTAL DEPTH: 100'	
LOGGED BY: PLB		CHECKED BY: JFA 2/29/89 DATE:			

BK ground = 0.2

PSH

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-1	0-2'	14-33-12-15	$\frac{20}{1.5}$	Clay - OK to blue to Bl clay w/ Tr silt and tr Fi sa, stiff, moist, some Charred layers, moderately Plastic (OL/CL) (Fill)	0.8- Plastic liner Clay 100 cap Ref	Bkg	0.2
S-2	2-4'	18-20-22-26	$\frac{22}{1.4}$	Similar to S-1 Silty clay - OK dim to black stiff, moist, moderately plastic, med to c sa lens at 0.8-1.0 (OL/CL) (Fill)	Ref	Bkg	0.2
S-3	4-6'	44-5-20	$\frac{20}{20}$	0-1.9 as above 1.9-2.0 Tan clay, Tr silt, plastic stiff, moist, (OL/CL) (Fill)	Took Analytical Change @ 4.9 from organic clay to clay	Bkg	0.2
S-4	6-8'	2-5-8-12	$\frac{20}{1.3}$	Tan clay, Tr silt, plastic, soft, moist (LL, Fill)	Ref	Bkg	0.2
S-5	8-10'	7-33-74 $\frac{100}{.2}$	$\frac{1.6}{1.2}$	0-2 as above 2-12 OK Tan gravelly sandy med to Fi sa some Fi gr, some c gr, moist, poorly graded, loose (SP Fill)	Ref Change @ 8.2' to gravelly sa	Bkg	0.2

FIELD BORING LOG

BORING NO. PB-8903

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- SAAP	PAGE 2	OF 4
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: Rodney Parr	DATE STARTED 1/31/89	COMPLETED 2/1/89
METHOD: HSA	CASING SIZE: 4.25" 10	TIP cv: 15	PROTECTION LEVEL: C Dermal
GROUND ELEV.: 868.2'	SOIL DRILLED: 100'	WATER LEVEL:	TOTAL DEPTH: 100'
LOGGED BY: RLB	CHECKED BY: JSP	2/27/89	DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-6	10-12'	46-92-98-100	2.0 2.0	similar to s-5' but well-graded (sw fill)	Took Analytical	BK ₃	0.3
S-7	12-14'	25-40-30-33	2.0 2.0	0-.8 as above as-20 Tan med to Fi ss, Tr very Fi ss, Tr c, poorly graded, damp, compact (sp?)	Ref Fill	BK ₃	0.2
S-8	14-16'	12-24-40-35	2.0 2.0	Tan med to Fi ss, Tr c, Tr c gr, poorly graded, compact to dense, damp, c ss bus at .9 (SP)	Analytical Native - 4.2 2/19.5 BNA	1.2 BK ₃	0.3
S-9	16-18'	14-21-40-47	2.0 2.0	As above w/ some stratification	Analytical (Native) NAM	BK ₃	0.2
S-10	18-20'	12-25-32-50	2.0	Tan med to Fi ss, Tr c ss, poorly graded, compact, damp, some stratification (SP)	Analytical	BK ₃	0.2
11	20-22'	15-25-70-77	2.0 1.5	0-.5 Tan med to Fi ss, w/ some c, well graded, compact, moist .5-1.0 - similar to S-10 1.0-1.5 Tan med to Fi sand, w/ some c, Tr c gr, dense (SP)	Analytical	BK ₃	0.2

FIELD BORING LOG				BORING NO. PBBS903	
PROJECT NO.: 5753-08		PROJECT NAME: USATHAMA-BAAP		PAGE 3 OF 4	
DRILLING CONTRACTOR: LAYNE-NORTHWEST		DRILLER: Rodney Parr		DATE STARTED 1/31/89 COMPLETED 2/1/89	
METHOD: HSA	CASING SIZE: 4.25" 10	TIP OV: #15		PROTECTION LEVEL: C Derma	
GROUND ELEV.: 868.2	SOIL DRILLED: 100'	WATER LEVEL:		TOTAL DEPTH: 100'	
LOGGED BY: PLB		CHECKED BY: JED 2/27/89		DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-12	22-24'	16-30-51-49	$\frac{2.0}{1.4}$	Tan med to Fi sa, poorly graded, dense, damp, c gr lens at .9 (SP)	Ref	Bkg	0.2
S-13	24-26'	15-2-32 $\frac{100}{.4}$	$\frac{1.9}{1.9}$	OK tan med to Fi sa, med in c sa, well graded, Tr med gr, Tr c gr, compact to dense, moist (SW)	Analytical	Bkg	0.2
S-14	26-28'	20, 40-53-57	$\frac{2.0}{2.0}$	As above	Ref	Bkg	0.4
S-15	28-30'	15-33-40-51	$\frac{2.0}{2.0}$	Tan sandy, med to Fi, Tr c, Tr c gr, poorly graded, compact, well strat. Gravel, moist (SP)	Ref	Bkg	0.2
2/2/89 S-16	30-32'	12-65-92-98	$\frac{2.0}{1.6}$	As above, but not as well stratified + dense	Analytical	Bkg	0.2
S-17	40-42'	30-58-60-50	$\frac{2.0}{2.0}$	Tan med to Fi sa, poorly graded dense, damp c sa lens B.8 (SP)	Analytical	Bkg	0.2

FIELD BORING LOG			BORING NO. PBB8903		
PROJECT NO.: 5753-08		PROJECT NAME: USATHAMA- BAAP		PAGE 4/ OF 4	
DRILLING CONTRACTOR: LAYNE-NORTHWEST		DRILLER: Rodney Furr		DATE STARTED 1/31/89 COMPLETED 2/1/89	
METHOD: ASA		CASING SIZE: 4.25 10		TIP cv: # 15	
GROUND ELEV.: 868.2		SOIL DRILLED: 100'		WATER LEVEL:	
LOGGED BY: PLB		CHECKED BY: JFL 2/27/89		DATE:	
				PROTECTION LEVEL: C Dermal	
				TOTAL DEPTH: 100'	

PI Heo

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
						TIP	LEL
S-18	50-52'	21-14-18-75	2.0 2.0	Tan med to Fi sa, poorly graded, dense, damp, c sa lens at .8-.9 (SP)	Change @ \approx 46' to beach sand Took Analytical	Bkg	0.2
S-19	60-62'	27-31-34-60	2.0 2.0	As above, but well stratified	Took Analytical	Bkg	0.2
S-20	70-72'	23-32-52-49	2.0 1.3	0-.17 dk brown sandy, gravel, med to Fi sa, Tr 6; Fi to 6 gr poorly graded, dense, damp (GP) .7-1.3 lt tan to lt gray, Fi to med sa, tr c sa, tr Fi gr, well graded, wither rock dust, dense, damp (SW)	Analytical Change @ \approx 78' from beach sec to S-21	Bkg	0.4
S-21	80-82'	33-50-35-73	2.0 2.0	dk tan to brown, med to fi sa, some c, very well graded, dense damp (SW)	Analytical PB Change	Bkg	0.5
S-22	90-92'	35-75-100-5	1.5 1.0	0-.5 as above .5-1.0 inc 14 c, well graded, dense to very dense, saturated BOB @ 100'	Analytical	Bkg	0.3

FIELD BORING LOG				BORING NO. PBB-8904	
PROJECT NO.: 5753-08		PROJECT NAME: USATHAMA-BAAP		PAGE 1 OF 5	
DRILLING CONTRACTOR: LAYNE-NORTHWEST		DRILLER: <u>RODNEY PARR</u>		DATE STARTED 2-2-89 COMPLETED 2-6-89	
METHOD: <u>HSA</u>	CASING SIZE: <u>4.5" ID</u>	TIP OV: <u>#15</u>	PROTECTION LEVEL: <u>C-Demo</u>		
GROUND ELEV.: <u>822.6</u>	SOIL DRILLED: <u>100'</u>	WATER LEVEL:	TOTAL DEPTH: <u>100'</u>		
LOGGED BY: <u>P. KAY/PLB</u>		CHECKED BY: <u>SPR 2/27/89</u>		DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
						TIP	444
S-1	0'-2'	25-60-50-24	$\frac{2.0}{1.3}$	0-1.3 DK brown silty clay w/ some trace of sand, trace c. sand, stiff, non-plastic damp (CL) (frozen) FILL	Ref. Probab. clay cap	Bkg 0.2	
S-2	2'-4'	13-13-12-9	$\frac{2.0}{1.3}$	0-1.3 Br Brown - Olive silty clay mod. plastic, stiff damp - FILL - (CL)	0-1 frozen reference	Bkg 0.2	
S-3	4'-6'	5-6-15-30	$\frac{2.0}{2.0}$	0-1.3 Same as above (CL) FILL 1.3-1.5 DK brown med-coarse sand, loose, damp (chance layer) 1.5-2.0 brown coarse sand trace gravel, loose, damp (sp) fine	Analytical change from clay cap to sand @ 5.5'	Bkg 0.2	
S-4	6'-8'	42-84-100 for 4	$\frac{1.9}{1.2}$	0-1.2 Lt. Brown sand actually well graded, w/ little gravel coarse rounded Dense, damp (sp) (GW) FILL?	reference	Bkg 0.2	
S-5	8'-10'	68-98-75-100 for 4	$\frac{1.9}{1.9}$	0-1.9 Lt. Brown gravelly sand well graded w/ tr c-sand Fine sand lens encountered at 1.3-1.5 (tan) Dense, damp (GW) (sp) NATIVE?	reference	Bkg 0.2	
S-6	10'-12'	56-32-45-31	$\frac{2.0}{2.0}$	0-2.0 Same as Above Fine - V. fine sp. lens @ 1.9-2.0	Analytical	Bkg 0.2	
S-7	12'-14'	13-20-22-30	$\frac{2.0}{1.9}$	0-1.9 DK. tan f-med sand w/ trace coarse sand, poorly graded stratified throughout spoon, med dense, damp (sp) Native	change to fine sands @ 12'		0.2

Background 2 PI H. d. oc

FIELD BORING LOG

BORING NO. PBB-8904

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA-BAAP	PAGE 2 OF 5
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: Rodney Perry	DATE STARTED 2/2/89 COMPLETED 2-6-89
METHOD: ASA	CASING SIZE: 4.25 ID	TIP SV: 15
GROUND ELEV.: 822.6	SOIL DRILLED: 100'	WATER LEVEL: TOTAL DEPTH: 100'
LOGGED BY: R. Perry / PLC	CHECKED BY: J. [unclear] 2/27/89	DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	WELL
5-8	14'-16'	12-22-27-31	$\frac{2.0}{1.8}$	Same as 5-7 (w/ Coarse Sand and trace of gravel) lens encountered @ 2 1.1' Native	Analytical	Bkg	0.2
5-9	16'-18'	19-48-33-21	$\frac{2.0}{1.0}$	0-0.3 Same as 5-7 0.3-1.8 Lt Brown gravelly sand well graded w/trace c-sand w/ little c-gravel Medium Dense, Damp (GW) well graded	reference change to gravelly sand @ 16.3'	Bkg	0.2
5-10	18'-20'	23-70-52-47	$\frac{2.0}{1.8}$	0-1.4 Lt. Brown gravelly sand, med-fine sand w/trace c-sand, w/trace c-gravel, w/trace fine gravel, well graded Dense, Damp, GW 1.4-1.8 Tan sand f-med coarse, dense, damp (SP) w/trace, poorly graded	reference from 19.4-20.5 layer of tan beach sand	Bkg	0.2
5-11	20'-22'	17-58-60-100 4	$\frac{1.9}{1.6}$	0-0.5 Tan sand, f-med coarse dense, damp (SP) w/trace coarse poorly graded 0.5-1.6 Dk. Brown gravelly sand med-f coarse, w/trace f-grav. and trace c-gravel, dense, damp well-graded (GW-SP) (Increase in coarse w/depth of spoon)	Analytical	Bkg	0.2
5-12	22'-24'	27-40-47-55	$\frac{2.0}{2.0}$	0-2.0 Lt. tan f-med sand w/trace fine gravel, poorly graded, dense, damp (SW-SP) (Coarse Sand lens @ 2 1.4')	reference		0.2

PI Hand 50'

FIELD BORING LOG				BORING NO. PB-8704	
PROJECT NO.: 5753- 08		PROJECT NAME: USATHAMA- BAAP			PAGE 3 OF 5
DRILLING CONTRACTOR: LAYNE-NORTHWEST		DRILLER: KERRY PAZE		DATE STARTED 2-2-89	COMPLETED 2-6-89
METHOD: HSA	CASING SIZE: 4.25" I.D.	TIP Ø: #15		PROTECTION LEVEL: C-DERMAL	
GROUND ELEV.: 822.6'	SOIL DRILLED: 100'	WATER LEVEL:		TOTAL DEPTH: 100'	
LOGGED BY: P. Kay / Paul B.		CHECKED BY: J. R. [Signature]		DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
						TIP	REL. W
S-13	24'-26'	25-56-83-100 4	1.9 1.9	0-1.2 Same as S-12 (SW-SP) (coarse sand w/ trace f-gravel, w C-gravel lens @ ~ 1.2') 1.2-1.9 (Same as S-12, increase (25.6') coarse sand	ANALYTICAL	Bkg	0.4
X	X	X			X		
S-14	26'-28'	30-45-52-60	2.0 1.6	same S-12 coarse sand lens @ 26.4'	Reference	Bkg	0.2
S-15	28'-30'	21-70-100 4	1.4 1.6	0-0.9 Same as S-12 0.9-1.6 ^{Brown pt} gravelly sand f-med sand w/ little coarse sand w/ trace fine gravel, w/ trace coarse gravel, well graded, dense, damp (GW?)	REFERENCE	Bkg	0.2
S-16	30'-32'	21-62-70-65	2.0 1.9	Same as S-12 w/ Coarse sand lens @ ~ 31'	ANALYT.	Bkg	0.2
S-17	40'-42'	22-44-20-82	2.0 2.0	Lt. tan f-m sand w/ little coarse trace fine gravel, trace coarse gravel, poorly graded, dense sl. damp (Sp)	Analytical	Bkg	0.5
S-18	50'-52'	15-4-41-65	2.0 2.0	0-1.0 Same as S-17 1.0-2.0 Lt. tan f-m sand w/ trace fine gravel, damp dense, poorly graded (Sp)	Analytical	Bkg	0.5

PI Head

FIELD BORING LOG				BORING NO. PFB-8704	
PROJECT NO.: 5753-08		PROJECT NAME: USATHAMA- BAAP		PAGE 4 OF 5	
DRILLING CONTRACTOR: LAYNE-NORTHWEST		DRILLER: <i>Fordy Parr</i>		DATE STARTED 2-2-89 COMPLETED 2-6-89	
METHOD: <i>HSA</i>	CASING SIZE: 4.25 "I.D."	TIP CV: #15	PROTECTION LEVEL: C-DENAL		
GROUND ELEV.: 872.6'	SOIL DRILLED: 100'	WATER LEVEL:	TOTAL DEPTH: 100'		
LOGGED BY: <i>R. Hay</i>		CHECKED BY: <i>2/27/89</i>	DATE:		

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	
5-19	60'-62'	10-19-20-23	$\frac{2.0}{2.0}$	Lt tan f-m sand w/ trace coarse p. graded, damp, med. dense. (SP) 0-4 sand is stained with green liquid waste	Encounter waste @ 60.0'	18ppm	2.9
5-20	70'-72'	9-28-75-160	$\frac{2.0}{2.0}$	0-1.0 SAME AS 5-19 w/ stratification due to green waste staining 1.0-2.0 Brown f-m sand w/ trace coarse sand, w/ little fine gravel, w/ trace coarse-gravel, well graded damp, v. dense, gravel stained w/ green waste liquid	Waste Change to gravelly sand @ 71' Analyzed!	29ppm	28.0
5-21	74'-76'	19-40-46-35	$\frac{2.0}{1.9}$	0-1.0 Brown sandy gravel w/ m-f sand, w/ little coarse gravel (1-2"), well graded, medium dense, damp (GW) Green stained gravel - through cut system (Waste)	Change to sand gravel @ 74' Analyzed!	3ppm	.3

PS Head

FIELD BORING LOG

BORING NO. FBB-89

PROJECT NO.: 5733-09

PROJECT NAME: USATHAMA-3AAP

PAGE 5 OF 5

DRILLING CONTRACTOR: LAYNE-NORTHWEST

DRILLER: *POPEY PARR*

DATE STARTED 2-6-89

COMPLETED 2-6-89

METHOD: *KA*

CASING SIZE: 4.25" I.D.

TIP GV: *4-10*PROTECTION LEVEL: *General*

GROUND ELEV.: 872.6'

SOIL DRILLED: 99.8'

WATER LEVEL:

TOTAL DEPTH: 100'

LOGGED BY: *P.C. KAY*CHECKED BY: *JFK* 2/27/89 DATE:*Head Space 0*

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			T/P	LE
5-22	80'-82'	34-38-42-68	$\frac{2.0}{1.9}$	0-.8 - Same as 5-21 <i>2nd damp.</i> Green liquid waste observed - staining gravel - sweet smelling (GW) .8-1.9 Brown gravelly sand f-m sand, w/ trace coarse sand, w/ little fine gravel w/ little coarse gravel, well-graded, trace Green V. damp, dense - Waste stratified through out sand	Analytical Waste <i>ANALYST</i> Change to gravelly sand from sandy gravel @ 80.8'	2-3 ppm	1.0
5-23	90'-92'	25-27-36-55	$\frac{2.0}{2.0}$	0-1.0 Lt. Brown m-sand w/ little dark brown coarse sand w/ trace fine gravel, poor-graded damp, dense (GP) 1.0-2.0 Lt. tan f-m sand w/ trace coarse sand, v. uniform Poorly - graded, damp, dense (GP)	Analytical taken Change to f-m sand @ 91' NO WASTE	0 ppm	.3
5-24	100'-102'	5-10-8-15	$\frac{2.0}{1.3}$	0-1.3 Brown gravelly sand w/ little f-m sand, w/ trace coarse gravel, w/ little fine gravel, well-graded, med, med. dense (GW) <i>Groundwater</i>	Change to gravelly sand Analytical	1 ppm	.2

No visible waste.

R.B. GAC

FIELD BORING LOG

BORING NO. PB08905

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA-BAAP	PAGE 1 OF 6
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: Rodney Farr	DATE STARTED 2-7-89 COMPLETED 2-13-89
METHOD: HSA	CASING SIZE: 4.25" I.D.	TIP #10 PROTECTION LEVEL: C-DERMAL
GROUND ELEV.: 879.9'	SOIL DRILLED:	WATER LEVEL: TOTAL DEPTH:
LOGGED BY: P. Kay / C. Hesse	CHECKED BY:	DATE: Jan Head Space Bkg = 0

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LOG
S-1	0'-2'	46-115-56-30	2.0 1.3	Dr. Br. silty clay - frozen. plastic, stiff, dense, hard. Fill OL	1st ft frozen Ref. S-1	0	0
S-2	2'-4'	16-24-16-14	2.0 0.8	Br silty clay, moist, plastic, very stiff, trace fine sand. CL-OL Fill Top 0.1" frozen	Ref.	0	0
S-3	4'-6'	22-45-43-50	2.0 1.9	4.0-4.5 - Same as above 4.5-5.0 Dark brown sandy silt, fine to med sand, loose, dry 5.0-6.0 lt. brown gravelly sand, little fine to med gravel, med. dense w/ dark brown silty sand lense at 5.6-5.8	Anal. cobbles at ~ 5	0	.1
S-4	6'-8'	40-74-78-100 in 5"	2.0 1.3	Br. gravelly silty sand trace fine gravel, little coarse gravel. med to coarse sand, poorly graded. Native? SW angular gravel	Ref. cobbles	0	.2

FIELD BORING LOG

BORING NO. PBB-8905

PROJECT NO.: 5753-08

PROJECT NAME: USATHAMA-BAAP

PAGE 2 OF 6

DRILLING CONTRACTOR: LAYNE-NORTHWEST

DRILLER: R. Pam

DATE STARTED 2/7/89

COMPLETED 2/13/89

METHOD: HSA

CASING SIZE: 4.25" ID

TIP cv: #10

PROTECTION LEVEL: Dermal

GROUND ELEV.: 879.9'

SOIL DRILLED:

WATER LEVEL:

TOTAL DEPTH:

LOGGED BY: E. Moore / E. Kay

CHECKED BY:

DATE:

Head Space Bk 0

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	etc
S-5	8-10'	100 for 4"	0.4 1.4	Same as above	On boulder will have 2 more (Ref.)	0	3.8
Shift in location ~ 4' S							
S-6	10'-12'	17-130-40 for 2"	1.2 1.0	Blow in - boulder fragment in soil Brown gravelly sand	No Anal. Ref.	0	.3
S-7	12'-14'	83-95-98-86	2.0 2.0	Br. Gravelly Sand well graded, ^{some} fine to med gravel, trace coarse gr. damp, very dense Some black coarse sand	Anal and Ref.	0	.2
S-8	14'-16'	51-85-111 for 4"	1.3 1.0	Same as above	Ref.	0	.2
S-9	16'-18'	31-41-41-45	2.0 2.0	16-16.8 Same as above 16.8-18 Lt brown sand, trace gravel poorly graded (uniform), dense	anal Change @ 16.8' Fill → Native Sampled native sand	0	0
S-10	18'-20'	15-29-38-43	2.0 2.0	Top Fine to med coarse sand, traces fine gravel poorly graded, darker sand lenses (clear stratification) Waste observed at 19.8 - olive green striations, sweet odor (similar to waste in PBB8904)	Anal. and Ref.	0	0

(similar to waste in PBB8904)

FIELD BORING LOG

BORING NO. PB88985

PROJECT NO.: 5753-08

PROJECT NAME: USATHAMA-3AAP

PAGE 3

OF 6

DRILLING CONTRACTOR: LAYNE-NORTHWEST

DRILLER: R. Parr

DATE STARTED 2/7/89

COMPLETED 2/13/89

METHOD: H5A

CASING SIZE: 4.25" ID

TIP CV: #10

PROTECTION LEVEL: Dermal wash D

GROUND ELEV.: 879.9'

SOIL DRILLED:

WATER LEVEL:

TOTAL DEPTH:

LOGGED BY: C. Moore/P. Kay

CHECKED BY:

DATE:

Jan
Head Space Bkg=0

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LOG
5-11	20-22'	15-29-43-67	$\frac{2.0}{2.0}$	20-21.6 Same as above 20.5-20.6 Observed waste saturation - greenish, moist layer (PI-1) 21.6-22 Brown gravelly sand, very dense some fine to med gravel, dryer than waste lens.	Anal. ? Ref. Change at 21.6 Sand → Gravelly sand	1	pt
5-12	22-24	47-56-73-99	$\frac{2.0}{2.0}$	22-22.8 Brown gravelly sand (as above) 22.8-23.4 Tan sand - poorly graded (uniform) 23.4-24 ^{lt.} Brown gravelly sand, very dense, some fine gravel (less gravel than above and mostly fine as opposed to med.)	Change at 22.8 Anal. Ref.		
13 5-14	24'-26'	31-45-40-60	$\frac{2.0}{1.1}$	Same as above, with a lens of fine tan sand at 25-25.3'. Gravelly sand has some coarse sand. Tan w/ black flecks. Gravel varies in color from grey to mustard to red Waste observed at 24.6-24.8' sampled.	Anal. ? Ref.	1.5	

FIELD BORING LOG				BORING NO. 7BB8905	
PROJECT NO.: 5753-08		PROJECT NAME: USATHAMA- BAAP			PAGE 4 OF 6
DRILLING CONTRACTOR: LAYNE-NORTHWEST		DRILLER: R. Parr		DATE STARTED 2/7/89 and COMPLETED 2/8	
METHOD: HSA	CASING SIZE: 4.25" ID	TIP Ø: #10		PROTECTION LEVEL: Level D	
GROUND ELEV.: 879.9'	SOIL DRILLED:	WATER LEVEL:		TOTAL DEPTH:	
LOGGED BY: C. Moore / P. King		CHECKED BY:		DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEI
S-14	26'-28'	76-107-50-56	$\frac{2.0}{1.6}$	Same as above to 27.8' Dark brown sand lense at 27.2-27.4 27.8-28 Light brown medium sand - poorly graded	Ref. Change at 27.8 gr. sand- sand.	0	
S-15	28'-30'	31-72-83-96	$\frac{2.0}{2.0}$	Same as above light brown gravelly sand, very dense, some fine to med gravel. Lenses of poorly graded med light brown sand.	Ref.	0	
S-16	30-32	25-40-42-85	$\frac{2.0}{2.0}$	Light brown gravelly sand, dense, traces of fine to med gravel Lense of darker sand at 30.5-30.8.	Anal E Ref (2/8/89)	0	

In
Head Space Bkg =

FIELD BORING LOG

BORING NO. PBB-89-05

PROJECT NO.: 5753-08

PROJECT NAME: USATHAMA-BAAP

PAGE 5 OF 6

DRILLING CONTRACTOR: LAYNE-NORTHWEST

DRILLER: R. PARR

DATE STARTED 2-7-89

COMPLETED 2-13-89

METHOD: HSA

CASING SIZE: 4.25" I.D.

TIP EV: #10

PROTECTION LEVEL: Level D

GROUND ELEV.: 879.9'

SOIL DRILLED:

WATER LEVEL:

TOTAL DEPTH:

LOGGED BY: P. Kay

CHECKED BY:

DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEC
S17	40'-42'	36-40-53-68	$\frac{2.0}{2.0}$	SAME AS 30'-32' (S16) Above C-sand lens @ 0.8' (40.8')	Analysis Ref (2/13/89)	0	
S18	50'-52'	5-18-25-32	$\frac{2.0}{1.9}$	tan f-m sand. w/trace f-m gravel w/trace coarse gravel w/tr C sand mod. dense, damp, (SP) stratified olive waste @ 50.8'	Analytical & Reference waste @ 50.6	.9	
S19	60'-62'	24-69-55-70	$\frac{2.0}{1.8}$	Same as above (SP) C-sand lens @ 60.5' Waste (olive-green) stratified @ 61.7' - very sweet smell	Analytical & Reference	8.8	
S20	70'-72'	25-32-37-58	$\frac{2.0}{1.9}$	Same as S18, dark (SP) & waste stratifications throughout spoon WASTE <u>WASTE</u>	Analytical & Reference	28	
S21	80'-82'	100 fol. 4"	$\frac{4}{0}$	No Recovery A few m-coarse gravel pieces w/ trace C-sand No Analytical	Reference	0	

Head Space

FIELD BORING LOG

BORING NO. PBB-89-05

PROJECT NO.: 5733-

PROJECT NAME: USATHAMA-BAAP

PAGE 6 OF 6

DRILLING CONTRACTOR: LAYNE-NORTHWEST

DRILLER: R. PARR

DATE STARTED 2-9-89

COMPLETED 2/13/89

METHOD: HSA

CASING SIZE: 9.25" I.D

TIP #10

PROTECTION LEVEL: D

GROUND ELEV.: 879.9'

SOIL DRILLED:

WATER LEVEL:

TOTAL DEPTH:

LOGGED BY: P. Kuy

CHECKED BY:

DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
522	90-92'	16-126-34-50	2.0 1.6	0-1.6 Brown Sandy Gravel w/trace c-gravel, little c-sand, dense, damp, v-damp @ 91.7' f-m	Analy Reference change to gravel @ 90'	8	
523	100'-102'	36-59-73-72	2.0 1.8	Lt. Brown Sand w/trace C-sand w/trace f-m gravel w/trace C-Gravel, dense (100-100.7 damp) (100-102' Wet P-graded	Analytical Refer change to Sand @ 100'	0	
524	110'-112'	19-23-41-75	2.0 0	NO RECOVERY Bob 110'	No Reference	0	

FIELD BORING LOG			BORING NO. <u>PBB-8706</u>	
PROJECT NO.: <u>5753-08</u>		PROJECT NAME: <u>USATHAMA-BAAP</u>		PAGE <u>1</u> OF <u>4</u>
DRILLING CONTRACTOR: <u>LAYNE-NORTHWEST</u>		DRILLER: <u>R. PARR</u>	DATE STARTED <u>2-14-89</u> COMPLETED	
METHOD: <u>HSA</u>	CASING SIZE: <u>4.25" I.D.</u>	TIP EV: <u>#1</u>	PROTECTION LEVEL: <u>D</u>	
GROUND ELEV.: <u>881.9'</u>	SOIL DRILLED: <u>112'</u>	WATER LEVEL: <u>110'</u>	TOTAL DEPTH: <u>112'</u>	
LOGGED BY: <u>P. Kay</u>		CHECKED BY:	DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S1	0'-2'	40-10-70-37	$\frac{2.0}{1.6}$	DK. Brown Silty Clay w/ trace f-m sand, w/tr c-sand, stiff, non-plastic damp, All Frozen (a) (Fill)	Reference All Frozen	0	C
S2	2'-4'	15-15-12-10	$\frac{2.0}{1.0}$	0-.3 SAME AS ABOVE FROZEN .3-1.0 DK. Brown Silty Clay w/trace f-m sand, stiff, mod. plast. damp (CL)	Ref 2.3-1.0 Not FROZEN Fill	0	0
S3	4'-6'	5-6-5-6	$\frac{2.0}{1.5}$	DK Brown Silty Clay w/tr. f-m sand, w/trace m-c gravel sl. plastic, soft, damp - Fill - (CL)	Analytical Ref. Fill	0	0
S4	6'-8'	5-5-5-5	$\frac{2.0}{1.8}$	DK Brown Sandy Clay f-m sand, sl. plastic, soft, damp, w/dr. black staining (silty) Brown wood shaving @ 6.3 - Fill.	Reference	0	0
S5	8'-10'	1-2-3-5	$\frac{2.0}{1.9}$	0-.7 Same as S-3 .7-1.9 Br. Silty Clay, w/trace m-sand, v-plastic V-damp, v-soft, w-some burnt wood piece throughout spoon (CL)	Reference	0	0
S6	10'-12'	1-2-3-7	$\frac{2.0}{1.4}$	Dr Brown clayey si w/apparent wood fibers & some m-sa, firm to stiff, moist, mod. plastic *mod. to strong odor	Analytical taken Fill	<u>588</u>	0
S7	12'-14'	2-1-2-14-5	$\frac{2.0}{1.0}$	Brown Sand w/ Dr Brown-Black silty staining, damp, loose strong odor	Analytical Ref	<u>1166</u>	

FIELD BORING LOG				BORING NO. PBZ-8906	
PROJECT NO.: 5753-08		PROJECT NAME: USATAMA- BAAP		PAGE 2 OF 4	
DRILLING CONTRACTOR: LAYNE-NORTHWEST		DRILLER: <u>RODNEY TORR</u>		DATE STARTED 2-14-89 COMPLETED	
METHOD: <u>ASA</u>	CASING SIZE: <u>1.25" I.D.</u>	TIP W: <u>#1</u>	PROTECTION LEVEL: <u>LEVEL D/LEVEL C</u>		
GROUND ELEV.: <u>881.9'</u>	SOIL DRILLED: <u>112'</u>	WATER LEVEL: <u>110'</u>	TOTAL DEPTH: <u>112'</u>		
LOGGED BY: <u>J. KAY</u>		CHECKED BY:		DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
						TIP	LEL
S-8	14-16	100-100 per 1	$\frac{2.5}{1.5}$	Same as Above Strong odor (Waste)	ANAL. Ref.	800	
S-9	16-18'	100-100 per 2	$\frac{7}{1.7}$	Gravelly sand (Lt. Brown) tr/c-gravel, tr-m-gravel v. dense, damp, pr. graded stained w/olive waste very strong odor (SP) NATIVE	Ref. Change to gravelly sand @ 16.0' Change to Native @ 16'	450	
S-10	18'-20'	13-17-17-17	$\frac{2.0}{1.5}$	SAME AS S-9 stained w/olive waste Strong Odor NATIVE	Refer.	1020	
S-11	20'-22'	8-15-14-10	$\frac{2.0}{1.8}$	SAME AS S-9 spoon stained w/waste (SP)	Analytical Ref	550	
S-12	25'-27'	2-4-5-6	$\frac{2.0}{1.0}$	Green sandy, pasty clay (Waste) w/trace c-sand, loose v. damp. - Native	Analytical Ref.	900	
S-13	30'-32'	1-1-1-2	$\frac{2.0}{1.2}$	Lt. Brown gravelly sand sand as S-9	A is R	300	
S-14	40'-42'	7-9-9-7	$\frac{2.0}{1.5}$	Brown Gravelly Sand m-f sand w/trace coarse gravel w/tr f-gravel w/tr c-sand, damp, well-graded loose - sat w/ waste NATIVE	A is R	45	

(SP)

WELD BORING LOG			BORING NO. P33-8706	
PROJECT NO.: 5753-08		PROJECT NAME: USATHAMA-BAAP		PAGE 3 OF 4
DRILLING CONTRACTOR: LAYNE-NORTHWEST		DRILLER: RODNEY PARR		DATE STARTED 2-14-89 COMPLETED
METHOD: HSA	CASING SIZE: 4.25" I.D.	TIP W/: #1	PROTECTION LEVEL: Level C	
GROUND ELEV.: 88.9'	SOIL DRILLED: 112'	WATER LEVEL: 110'	TOTAL DEPTH: 112'	
LOGGED BY: J. Day		CHECKED BY:		DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-15	50'-52'	15-23-28-38	$\frac{2.0}{2.0}$	SAME AS S-14 But Spoon is <u>NOT</u> SAT w/WASTE WASTE IS STRATIFIED THROUGHOUT SPOON - GREEN IN COLOR	Analytical Reference	9	
S-16	60'-62'	17-26-40-72	$\frac{2.0}{2.0}$	tan Sand fine w/trace C-sand, w/tr f-m gravel, mod. dense, damp pr. graded coarse sand lense @ 61.5' A few stratifications of waste throughout the Spoon (SP) native	ANALYTICAL Reference change from gravelly sand to f-m sand @ 60'	9	
S-17	70'-72'	19-29-48-70	$\frac{2.0}{2.0}$	SAME AS S-16 silty sand lense @ 70.6' waste stratified through Spoon	Anal.	5	
S-18	80'-82'	80-117-90 -100 for 3'	$\frac{1.8}{1.8}$	LI. Brown Sandy Gravel (m-c) w/trace C-sand, w/tr f-m gravel, mod. dense, damp, v.-dense, w.-gd. m-c sand w/trace f sand, w/ little m.-gravel, w/trace coarse gravel, damp, v.-dense, w.-gd. No waste present	Analytical Reference No waste	0	

(GW)

FIELD BORING LOG				BORING NO. PBB-89	
PROJECT NO.: 5753-		PROJECT NAME: USATHAMA- BAAP			PAGE 4 OF 4
DRILLING CONTRACTOR: LAYNE-NORTHWEST		DRILLER: R. PER		DATE STARTED 2-14-89 COMPLETED	
METHOD: HSA	CASING SIZE: 4.25" I.D.	TIP cv: #1		PROTECTION LEVEL: D	
GROUND ELEV.: 88.9'	SOIL DRILLED: 112'	WATER LEVEL: 110'		TOTAL DEPTH: 112'	
LOGGED BY: P. Kay		CHECKED BY:		DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
						TIP	LEL
5-19	90'-92'	45-46-30-36	$\frac{2.4}{1.7}$	Brown Gravelly Sand, m-c-sand w/some fine gravel, w/trace c-gravel, dense, v.damp pr. grad. No waste (SP)	Analyt. Refer	0	
5-20	100'-102'	29-45-67-83	$\frac{2.0}{2.0}$	Tan sand, f-m, pr. grad v.damp, dense medium pch (SP)	Analyt. Refer	0	
5-21	110'-112'	25-30-20-25	$\frac{2.0}{1.2}$	Brown C-sand w/some f-gravel, w/trace m-sand, dense, pr. grad saturated (SP)	Analyt. Refer		
				BOB 110'			

FIELD BORING LOG				BORING NO. PBB-8907	
PROJECT NO.: 5753-08		PROJECT NAME: USATHAMA-BAAP		PAGE 1 OF 3	
DRILLING CONTRACTOR: LAYNE-NORTHWEST		DRILLER: R. PARR		DATE STARTED 2/16/89 COMPLETED 2/17/89	
METHOD: HSA	CASING SIZE: 4.25"	TIP W: 10.0	PROTECTION LEVEL: C DERMAL		
GROUND ELEV.: 878.6'	SOIL DRILLED:	WATER LEVEL:	TOTAL DEPTH: 80 FEET		
LOGGED BY: JS, BUN		CHECKED BY:		DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
5-1	0-2	250 for 5	2.0 1.5 1.3	Br si m-f sa w/some m-sl, frozen Fill	Ref.	0	
5-2	2'-4'	9/11/11/22	2.0 2.0	Br si clay, w some to little msa, stiff, dry, mod. plastic Fill	Analytical REF	0	
5-3	4'-6'	24/50/95/92	2.0 1.8	Br GR SA, F-MC SA w/ F-C GR, TR SIL, DENSE DRY W GRD FILL	COBBLES ANALYTICAL	0	
5-4	6-8'	10/60/100 for 5	2.0 1.5 1.5	Br msandy gvl, dry, med dense, p. graded, nonpl. Fill	Ref. -Dr gray change @ ~ 7.5'	0	
5-5	8'-10'	63/100 for 5	1.5 1.2	similar to 5-4	Ref.	0	
5-6	10'-12'	40/74/80/100	2.0 1.7	similar to 5-4, gvl 70% at the bottom of the sample 11.5'	Analytical Taken (BNA, NAM)	0	
5-7	12'-14'	50/58/48/36	2.0 1.8	similar to 5-4 w/ a change to m-f sa w/ trace gvl (apparent native?)	change @ 13.0' to Native Soil	0	
5-8	14'-16'	20/38/36/38	2.0 1.6	lt Br si m-f sa w/ some med. rounded gvl, sl. moist, loose, poorly sorted graded, nonpl. SP	Analytical Taken	0	
5-9	16'-18'	17/26/33/41	2.0 2.0	similar to 5-8. w/ < 90% of gvl, slight stratification	Ref. Taken	0	
10	18-20'	16/32/41/55	2.0 2.0	TAN F-M SA w/ TR C SA GRADING TO A MOSTLY VF-F SA w/ TR SILTY SAND LAYERING, P GRD LOOSE, DAMP SP	REF	0	

FIELD BORING LOG				BORING NO. PBB-8907	
PROJECT NO.: 5753-08		PROJECT NAME: USATHAMA- BAAP		PAGE 2 OF 3	
DRILLING CONTRACTOR: LAYNE-NORTHWEST		DRILLER: R PARR		DATE STARTED 2/16/89 COMPLETED	
METHOD: HSA	CASING SIZE: 4.25"	TIP Ø: 10.0		PROTECTION LEVEL: C DELHAL	
GROUND ELEV.: 878.6'	SOIL DRILLED:	WATER LEVEL:		TOTAL DEPTH: 80 FEET	
LOGGED BY: JS, BM		CHECKED BY:		DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-11	20-22	30/36/52/45	$\frac{2.0}{2.0}$	Similar to S-10, w/ weathered rock frag.	Analytical Taken (BNA)	0	
S-12	22'-24'	45/54/71/60	$\frac{2.0}{1.7}$	Similar to S-10 w/ 7 Gvl	Ref.	0	
S-13	24-26'	20/54/98/74	$\frac{2.0}{2.0}$	Similar to S-10	Analytical Taken	0	
S-14	26'-28'	25/45/50/76	$\frac{2.0}{2.0}$	Similar to S-10	Ref.	0	
S-15	28'-30'	15/33/90/100	$\frac{2.0}{2.0}$	Similar to S-10	Ref.	0	
S-16	30'-32'	33/65/100 for 0-45	$\frac{2.0}{1.5}$	LT Br m sa w/ some trace si, little rounded m gvl, sl. moist, loose, poorly graded, nonplastic SW SP	Analytical Taken	0	
S-17	40'-42'	42/59/60/60	$\frac{2.0}{2.0}$	LT Br, 40'-41' similar to S-16 41'-42 LT Br m-f sa w/ little f rounded gvl, sl. moist, loose, poorly graded, nonplastic SW-SP	Analytical Taken Change @ 41'	0	
S-18	50'-52'	26/50/61/73	$\frac{2.0}{2.0}$	50-51.7 LT BR PERD F-M SA, LOOSE, DAMP 51.7-52 LT BR UNIFORM F SAND SP	ANALYTICAL	0	

BORING NO. PBB-8907

PROJECT NAME: USATHAMA- BAAP

PAGE 3 OF 3

DRILLER: B. PARK

DATE STARTED 2/6/89

COMPLETED 2/17/80

METHOD: HSA

CASING SIZE: 4.25"

TIP EV: 10.0

PROTECTION LEVEL: C DERMAL

GROUND ELEV.: 878.6

SOIL DRILLED:

WATER LEVEL:

TOTAL DEPTH: 80 FEET

LOGGED BY: JS, BCM

CHECKED BY:

DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.		DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.				TIP	LEL
S-19	60-62'	30/60/70/ 100 to 4 INCHES			FA LT BR SAND, P GRD, ALTERNATING LAYERS (~0.4-0.6') OF F-H W/ TR C SAND AND F SA LOOSE, DAMP SP	ANALYTICAL	0	
S-20	70-72'	42/60/65/ 100 to 4 INCHES			SPAWN, 15' AUGER, AND 10' OF A ROD LOST DOWN HOLE. S-20 COULD NOT BE RETRIEVED.	COBBLE ZONE-STARTED AT 73'		

BOB = 80 FEET

MAP Logging Fine Complete. ✓

FIELD BORING LOG		BORING NO. PBB-89-10	
PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA-BAAP	PAGE 1	OF 3
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: Jeff Seager	DATE STARTED 1-6-89	COMPLETED 1-19-89
METHOD: Mud Rotary	CASING SIZE: 0.9' o.d. 1.0'	TIP W: # 10	PROTECTION LEVEL: D
GROUND ELEV.: 878.1'	SOIL DRILLED: 260.5'	WATER LEVEL: ± 120	TOTAL DEPTH: 260.5'
LOGGED BY: FREDERICK Bragdon		CHECKED BY:	DATE: 1-6-89 —

SAMPLE NO.	DEPTH IN FEET	BLACS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
2-1	0-4'			Dark brown SILT (Loess)			Background
S-1	9-11	—	1.2'	Brown Med. to Co Gravel with matrix of Lt & dk brown SILT and sand. (S-1)	See field note Book notes		
S-2	20-22'		1.5'	Brown sandy Gravel over rotten gabbro rubble (.4') over well stratified med to co SAND w/ trace of gravel (S-2)	Pages 1 to Note Book #3 (Deep Borings/monitoring wells)		
S-3	30-32	35/12"	1.1	Brown faintly stratified med to Co. Sand w/ tr of fine gravel (S-3)			
S-4	47			wash 5' up hole			
S-5	47-49	30/12"	1.1	Needs new bentonite (SP) Brown fine sand (S-5) w/ thin well defined co SA with fine gravel layers			
S-6	57-59	38/12"	1.2	Br med to Co. Sand w/ fine gravel (S-6) grading to beach sand (i.e. fine to med SAND) (SP)			
S-7	67-69	48/12"	1.2	Brown faintly stratified uniform fine to med SA (S-7) w/ one thin SA fine gravel layer (SP)			
S-8	77-78.5	7100/12"	.9	Br med to Co. SAND and layers of sandy gravel (SP) to (SW)			

FIELD BORING LOG

BORING NO. *PFB-09-10*

PROJECT NO.: *9733-08* PROJECT NAME: *USATHAMA-BAAP* PAGE *2* OF *3*

DRILLING CONTRACTOR: *LAYNE-NORTHWEST* DRILLER: *Jeff Sanger* DATE STARTED *1-6-89* COMPLETED *1-19-89*

METHOD: *Mud* CASING SIZE: *0.9'* TIP GV: *#10* PROTECTION LEVEL: *0*

GROUND ELEV.: *878.1'* SOIL DRILLED: *260.5'* WATER LEVEL: *± 120'* TOTAL DEPTH: ~~*260.5'*~~ *260.5'*

LOGGED BY: *Fred Brazdon* CHECKED BY: DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	REL.
S-9	87-87.5		.4				
S-10	97-99	75/12"	1.2	Br-SANDY Gravel to Gravel (high porosity?) (GW)			
S-11	106-108	50/12"	1.3	Brown-SA Gravel w/ some some "pea gravel" (SP)			
	121-123	100/12"	.8	Brown fine to med SAND w/ trace of Co SAND in layers (SP)	✓ change @ 120'		
S-13	131-133	42/12"	1.4	Brown med SAND w/ some Co. SAND and few pebbles (SP)			
S-14	141-142	>100/12"	1.3	Brown med SAND w/ + of Co SAND and few pebbles over Co. SANDY gravel (S-14) (GW)	✓ change @ 140'		
S-15	149-151	78/12"	1.1	Co SANDY Gravel (GW)			
S-16	159-161	100/12" + 30/12"	1.4	Co SANDY Gravel (GW)			
S-17	169-171	45/12"	0.8	Co SANDY Gravel w/ larger cobbles (GW)			
S-18	179-181	84/12"	1.4	Reddish brown fi to med SAND MASSIVE NO strata uniform (SP)	✓ change @ 175'		
S-19	189-191	7100/12"	.7	SAME uniform (SP)			
S-20	199-201	44/12"	1.4	same Reddish brown fi to med SA uniform (SP)			
S-21	209-210.5	>100/12"	1.2	Brown fine SAND uniform (SP)			

FIELD BORING LOG

BORING NO. FB-89-10PROJECT NO.: 5753-08PROJECT NAME: USATHAMA-BAAPPAGE 3 OF 3DRILLING CONTRACTOR: LAYNE-NORTHWESTDRILLER: Jeff SaegeDATE STARTED 1-6-89COMPLETED 1/19/89METHOD: MUD LOGCASING SIZE: 0.9'TIP W: #10PROTECTION LEVEL: DGROUND ELEV.: ± 878.1'

SOIL DRILLED:

WATER LEVEL:

TOTAL DEPTH:

LOGGED BY: J. Pickett

CHECKED BY:

DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-22	219-225'	—	$\frac{1.5}{1.5}$	Reddish Brown fine to med sand w/ trace of gravel Dense, wet, non plastic (SP)			
S-23	229-231	—	$\frac{2.0}{1.5}$	SIMILAR TO S-22 but w/ increase in silt. (SP)	few cobbles drilling from 229 to 239		
end of 1st 10 DAY Shift.							
S-24	239-241	175 for Total	$\frac{2.0}{1.5}$	Reddish Brown to Gray uniform fine to medium sand w/ trace of silt thin silt layer, non plastic wet, Dense (SP)	few cobbles drilling from 239 to 249		
S-25	249-251	140 for 2.0' even driving	$\frac{2.0}{1.0}$	SIMILAR TO S-24 but w/ few stratified medium sand layers	few cobbles from 249 to 259		
S-26	257-260.5'	300 for 1.0' 150 for 0.5' very hard driving	$\frac{1.5}{1.5}$	Top 1.0' is Reddish Brown to gray sand w/ gravel & quartzite cobbles @ 260' change to white & light brown fine to med sand / sandstone. Very dense non plastic not cemented	Probed Boring @ 260.5' in white / Brown weathered sandstone.		

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. PBB-82-01Surface Elevation 876.8Job No. C.10313Sheet 1 of 2

1409 EMIL STREET • P.O. BOX 9536, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	Type	Recovery ↓	Moisture ↓	N	Depth		q _s	W	LL	PL	D
1	SS	15"	M	28	3"	3" GRAVEL & CINDERS, 12" TOPSOIL Very Stiff, Dark Brown (10YR 3/3) Silty CLAY (CL)					
2	3"ST	18"	M	-	5"	** Occasional Sand & Gravel at 4'	(2.5)				
3	SS	12"	M	51	10"	Very Dense, Light Olive Brown (2.5Y 5/4) Fine to Coarse SAND, Some Silt & Clay, Some Gravel, Occasional Cobbles (SM)					
4	SS	8"	M	61	15"						
5	SS	12"	M	28	20"						
6	SS	7"	M	20	25"						
7	SS	12"	M	26	30"	Medium Dense to Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Medium SAND, Little Silt, Some Gravel (SP-SM)					
8	SS	15"	M	65	35"						
					40"						
					45"						

* 2.5' of Frost Present

**Shelby Tube Hydraulically
Pushed at 1100 PSI from 3' - 5'

() Pocket Penetrometer
Reading, TSF

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. PBB-82-01Surface Elevation 876.8Job No. C-10313Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9636, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				P	W	LL	PL	D
No.	Type	↓	↓	M	Depth						
						Medium Dense to Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Medium SAND, Little Silt, Some Gravel (SP-SM)					
9	SS	15"	M	38	50	Less Silt at 49'					
						End Boring at 50'					
					55						
					60						
					65						
					70						
					75						
					80						
					85						

WATER LEVEL OBSERVATIONS						GENERAL NOTES	
While Drilling	None					Start	2/18/82
Upon Completion of Drilling						Complete	2/18/82
Time After Drilling	$\frac{1}{2}$ hour					Crew Chief	JWG/MG
Depth to Water	10.0'					Rig	55-1
Depth to Cave In						Drilling Method	CS 0-10'
						DM/WD	10-50'
						DC(4")	0-10'

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. PBB-82-02Surface Elevation 883.9Job No. C-10313Sheet 1 of 2

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture				G _s	W	LL	PL	D	
No.	Type	↓	↓	M	Depth							
1	SS	14"	M	11	5	12" TOPSOIL Stiff, Brown to Dark Brown (10YR 4/3) Silty CLAY, Trace of Fine Sand (CL)	(1.5)					
2	ST	6"	M	-	5		(1.4)					
3	SS	18"	M	16		Loose to Very Dense, Light Olive Brown (2.5Y 5/4) Fine to Medium SAND, Little Silt, Some Gravel (SP-SM)						
4	SS	18"	M	10	10							
5	SS	18"	M	35	15		Color Change to Light Yellowish Brown (2.5Y 6/4) at 14'					
6	SS	18"	M	42	20							
7	SS	12"	M	72	25	Trace to Little Gravel from 14' to 29'						
8	SS	12"	M	24	30							
					35	Medium Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Coarse SAND and GRAVEL, Little Silt (SP-SM) * Shelby Tube Pushed Hydraulically at 600 PSI from 3'-5'	() Pocket Penetrometer Reading, TSF					
					40							
					45							

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. PBB-82-02Surface Elevation 883.9Job No. C 10313Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9838, MADISON, WIS. 53716 • TEL. (608) 257-4848

SAMPLE

Recovery

Moisture

No. Type ↓ ↓ M Depth

9 SS 17" M 26 50

**VISUAL CLASSIFICATION
and Remarks**Medium Dense, Light Yellowish
Brown (2.5Y 6/4) Fine to Coarse
SAND and GRAVEL, Little Silt
(SP-SM)

End Boring at 50'

SOIL PROPERTIES

* W LL PL D

WATER LEVEL OBSERVATIONS

None

While Drilling _____

Upon Completion of Drilling _____

Time After Drilling 1/2 hour _____Depth to Water 10.0' _____

Depth to Cave In _____

GENERAL NOTES

2/22/82 Complete 2/22/82
 Start _____
 Crew Chief WJG/JS Rig 55-1
 Drilling Method CS 0-10'
DM/WO 10-50'
DC(4") 0-10'

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. PBB-82-03Surface Elevation 877.4Job No. C 10313Sheet 1 of 2

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	Type	Recovery ↓	Moisture ↓	M	Depth		G _s	W	LL	PL	D
1	SS	24"	M	22		Dark Brown (10YR 3/3) Silt TOPSOIL					
2	3"ST	12"	M	-	5	Stiff, Dark Brown (10YR 3/3) * Silty CLAY (CL)	(1.5)				
3	SS	21"	M	30		**					
4	SS	24"	M	71	10	Medium Dense to Very Dense, Light Olive Brown (2.5Y 5/4) Fine to Coarse SAND and GRAVEL, Trace of Silt, Occasional Cobbles (GW)					
5	SS	15"	W	38	15						
6	SS	15"	W	39	20	Dense to Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Medium SAND, Trace Silt, Little Gravel, Occasional Cobbles (SP)					
7	SS	18"	W	101	25						
8	SS	18"	W	151	30	Little to Some Coarse Sand & Gravel Encountered at Samples 7 and 8.					
					35	* Shelby Tube Pushed Hydraulically at 1400 PSI from 3' - 5'					
					40	**Dark Brown (10YR 3/3) Fine to Medium Silty SAND (SM)					
					45						

() Pocket Penetrometer Reading, TSF

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. PBB-82-03Surface Elevation 877.4Job No. C.10313Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9636, MADISON, WIS. 53716 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		Moisture		N	Depth		G	W	LL	PL	D
No.	Type	↓	↓								
9	SS	18"	W	32	50	Dense to Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Medium SAND, Trace Silt, Little Gravel, Occasional Cobbles (SP)					
					55	End Boring at 50'					
					60						
					65						
					70						
					75						
					80						
					85						

WATER LEVEL OBSERVATIONS						GENERAL NOTES	
While Drilling						Start	2/18/82
Upon Completion of Drilling						Complete	2/18/82
Time After Drilling	1/2 hour					Crew Chief	LS Rig 55-2
Depth to Water	8' DM					Drilling Method	CS 0-10'
Depth to Cave In						DM/WO	10-50'
						DC(4")	0-10'

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. PBB-82-04Surface Elevation 881.0Job No. C 10313Sheet 1 of 2

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		Moisture		N	Depth		P _r	W	LL	PL	D
No.	Type	↓	↓								
1	SS	24"	M	19	**	Medium Dense to Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Coarse SAND and GRAVEL, Little Silt, Occasional Cobbles (SP-SM)					
2	SS	18"	M	51	5						
3	SS	15"	M	66							
4	SS	18"	M	101	10						
5	SS	18"	W	86	15						
6	SS	18"	W	38	20	Dense to Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Coarse SAND, Trace Silt, Some Gravel (SP)					
7	SS	17"	W	140	25						
8	SS	18"	W	101	30						
					35						
					40						
					45	* Medium Dense, Dark Yellowish Brown (10YR 4/4) Fine to Coarse Clayey SAND, Trace Gravel (SC) ** 2' of Frost Present					

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. PBB-82-04Surface Elevation 881.0Job No. C 10313Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9838, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		Moisture		N	Depth		P	W	LL	PL	D
No.	Type	↓	↓								
9	SS	X	W	111	50	Dense to Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Coarse SAND, Trace Silt, Some Gravel (SP)					
					55	End Boring at 50'					
					60	*** Less Coarse Sand & Gravel at 49'					
					65						
					70						
					75						
					80						
					85						
WATER LEVEL OBSERVATIONS						GENERAL NOTES					
While Drilling _____						Start <u>2/22/82</u> Complete <u>2/22/82</u>					
Upon Completion of Drilling _____						Crew Chief <u>L.S. Rig 55-2</u>					
Time After Drilling <u>1/2 hour</u>						Drilling Method <u>CS 0-10'</u>					
Depth to Water <u>8' DM</u>						DM/WO <u>10-50'</u>					
Depth to Cave In _____						DC(4") <u>0-10'</u>					

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
 Location Baraboo, Wisconsin

Boring No. PBB-82-05
 Surface Elevation 872.9
 Job No. C 10313
 Sheet 1 of 2

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		Moisture		N	Depth		G _s	W	LL	PL	D
No.	Type	↓	↓								
						10" Dark Silt TOPSOIL					
1	SS	18"	M	16		Stiff, Dark Yellowish Brown (10YR 4/4) Silty CLAY (CL)					
2	3"ST	12"	M	-	5	Shelby Tube Pushed Hydraulically at 800 PSI from 3' - 5'	(1.7)		49.9	26.2	
3	SS	24"	M	7		*					
4	SS	30"	M	33	10	Dense to Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Coarse SAND and GRAVEL, Little Silt & Clay (SP-SM)					
5	SS	18"	W	105	15						
6	SS	9"	W	81	20						
7	SS	12"	W	67	25	Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Medium SAND, Trace Silt, Little Gravel (SP)	()				Pocket Penetrometer Reading, TSF
8	SS	15"	W	100	30						
					35	* Loose, Dark Yellowish Brown (10YR 4/4) Fine to Medium SAND, Some Silt & Clay, Trace Gravel (SM)					
					40						
					45	Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine SAND, Little Silt (SP-SM)					

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
 Location Baraboo, Wisconsin

Boring No. PBB-82-05
 Surface Elevation 872.9
 Job No. C 10313
 Sheet 2 of 2

1408 EML STREET • P.O. BOX 9536, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		Moisture		N	Depth		P	W	LL	PL	D	
No.	Type	↓	↓									
9	SS	17"	W	83	50	Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine SAND, Little Silt (SP-SM) End Boring at 50'						
WATER LEVEL OBSERVATIONS						GENERAL NOTES						
While Drilling _____						Start <u>2/16/82</u> Complete <u>2/16/82</u>						
Upon Completion of Drilling _____						Crew Chief <u>LS</u> Rig <u>55-2</u>						
Time After Drilling <u>1/2</u> hour _____						Drilling Method <u>CS 0-10'</u>						
Depth to Water <u>6' DM</u> _____						DM/WD <u>10-50'</u>						
Depth to Cave In _____						DC(4") <u>0-10'</u>						



LOG OF TEST BORING

Location Baraboo, Wisconsin

Sheet 1 of 2

1409 EMIL STREET • P.O. BOX 9536, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	Type	Recovery ↓	Moisture ↓	N	Depth		W	LL	PL	D	
1	SS	24"	M	19	5	FILL: Black (5Y 2.5/1) Clayey Silt & Cinders					
2	SS	30"	M	9	6	18" TOPSOIL					
3	3"ST	24"	M	-	7	Stiff, Dark Brown (10YR 3/3) Silty CLAY (CL) *	(1.3)				
4	SS	30"	M	58	10	Dark Brown (10YR 3/3) Fine to Medium Silty SAND (SM)					
5	SS	18"	W	49	15	Dense to Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Coarse SAND and GRAVEL, Little Silt & Clay (SP-SM) Less Gravel at 15'					
6	SS	18"	W	44	20						
7	SS	18"	W	92	25	Dense to Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Medium SAND, Trace Silt, Trace to Little Gravel (SP)	()				
8	SS	16"	W	37	30						
					35						
					40						
					45						

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. PBB-82-06Surface Elevation 866.8Job No. C-10313Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9636, MADISON, WIS. 53716 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		Moisture		N	Depth		P	W	LL	PL	D
No.	Type	↓	↓								
9	SS	16"	W	88	50	Dense to Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Medium SAND, Trace Silt, Trace to Little Gravel (SP)					
					55	End Boring at 50'					
					60						
					65						
					70						
					75						
					80						
					85						
WATER LEVEL OBSERVATIONS						GENERAL NOTES					
While Drilling _____						Start <u>2/16/82</u> Complete <u>2/16/82</u>					
Upon Completion of Drilling _____						Crew Chief <u>LS</u> Rig <u>55-2</u>					
Time After Drilling <u>1/4</u> hour _____						Drilling Method <u>CS 0-10'</u>					
Depth to Water <u>8' DM</u> _____						DM/WO <u>10-50'</u>					
Depth to Cave In _____						DC(4") <u>0-10'</u>					

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. PBB-82-07Surface Elevation 865.4Job No. C-10313Sheet 1 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				q _s	W	LL	PL	D
No.	Type	↓	↓	M	Depth						
						12" TOPSOIL					
1	SS	18"	M	13		Stiff, Dark Brown (10YR 3/3) Silty CLAY (CL)	(1.5)				
2	3"ST	18"	M	-	5	*					
						**					
3	SS	18"	M	33							
4	SS	24"	M	55	10						
						Dense to Very Dense, Pale Yellow (2.5Y 7/4) Fine to Medium SAND, Trace to Little Silt, Trace to Little Gravel, Occasional Cobbles (SP-SM)					
5	SS	18"	W	44	15						
6	SS	18"	W	56	20	More Coarse Sand & Gravel Encountered from 17' - 20'					
7	SS	18"	W	96	25	* Shelby Tube Pushed Hydraulically from 3' - 5' at 1100 PSI					
8	SS	18"	W	83	30	** Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Coarse SAND, Little Silt and Clay, Little Gravel (SP-SM)	()				
					35						
					40						
					45						

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. PBB-82-07Surface Elevation 865.4Job No. C 10313Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9638, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				q _s	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
9	SS	15"	W	98	50	Dense to Very Dense, Pale Yellow (2.5Y 7/4) Fine to Medium SAND, Trace to Little Silt, Trace to Little Gravel, Occasional Cobbles (SP-SM)					
						End Boring at 50'					
					55						
					60						
					65						
					70						
					75						
					80						
					85						

WATER LEVEL OBSERVATIONS						GENERAL NOTES	
While Drilling _____						Start <u>2/16/82</u> Complete <u>2/16/82</u>	
Upon Completion of Drilling _____						Crew Chief <u>LS</u> Rig <u>55-2</u>	
Time After Drilling <u>1/2</u> hour						Drilling Method <u>CS 0-10'</u>	
Depth to Water <u>6' DM</u>						DM/WO <u>10-50'</u>	
Depth to Cave In _____						DC(4") <u>0-10'</u>	

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
 Location Baraboo, Wisconsin

Boring No. PBB-82-08
 Surface Elevation 871.9
 Job No. C 10313
 Sheet 1 of 2

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture		Depth		q _s	W	LL	PL	D
No.	Type	↓	↓	N							
1	SS	12"	M	41		Dense, Dark Brown (10YR 3/3) Fine to Coarse SAND, Some Silt & Clay, Some Gravel (SM)					
2	SS	12"	M	42	5	Medium Dense to Dense Light Olive Brown (2.5Y 5/4) Fine SAND, Little Silt, Little Gravel, Occasional Cobbles (SP-SM)					
3	SS	12"	M	14							
4	SS	18	M	22	10						
5	SS	12"	M	20	15						
6	SS	12"	M	34	20	Dense to Very Dense, Olive Brown (2.5Y 4/4) Fine to Coarse SAND, Trace Silt, Little to Some Gravel (SP)					
7	SS	8"	M	63	25						
8	SS	12"	M	60	30						
					35	More Gravel Encountered at 30'					
					40						
					45						

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. PBB-82-08Surface Elevation 871.9Job No. C 10313Sheet 2 of 2

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				G _s	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
9	SS	12"	M	65	50	Dense to Very Dense, Olive Brown (2.5Y 4/4) Fine to Coarse SAND, Trace Silt, Little to Some Gravel (SP) *					
					55	End Boring at 50'					
					60	* Some Silt at 50'					
					65						
					70						
					75						
					80						
					85						

WATER LEVEL OBSERVATIONS						GENERAL NOTES	
While Drilling _____						Start <u>2/17/82</u> Complete <u>2/17/82</u>	
Upon Completion of Drilling _____						Crew Chief <u>WG/MC</u> Rig <u>55-1</u>	
Time After Drilling <u>1/2</u> hour _____						Drilling Method <u>CS 0-10'</u>	
Depth to Water <u>20'</u> _____						DM/WO <u>10-50'</u>	
Depth to Cave In _____						DC(4") <u>0-10'</u>	

FIELD BORING LOG				Boring No. PBP-91-01	
Project No. 06553-03		Project Name RANGER AAP		Page 1 of 4	
Contractor LAYNE		Driller G. B. BARNWELL		Date started 10-12-91 completed 10-13-91	
Method DIAL WALL		Casing Size 9" O.D.		HNW 11.7/10.2	
Ground El.		Soil Drilled 253.5'		Protection Level >	
		& below ground 95'		Total Depth 253.5'	
Logged by RRR		Checked by DRP		Date 10/16/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNW	LEL
	0-10'			BROWN SILT, SOME CLAY, TR. F SAND, PGD. (MU)	DID NOT HAVE FUNCTIONING TIP OR HNW	JAR	ATR
	10-20'			LT BROWN SAND, PGD, F, LITTLE M SAND, TR SILT, TR COBBLES	(SP)		0
	20-30'			LT BROWN SAND, F-M, PGD, LITTLE C SAND, TR F GRAV., TR SILT, TR COBBLES	(SP)		0
	30-40'			LT BROWN SAND, PGD, F, SOME M SAND, LITTLE SILT, LITTLE C SAND, TR F GRAVEL.	(SP)		0
	40-50'			40-43': LT BROWN SAND PGD, M, SOME F SAND, LITTLE C SAND, TR GRAV., TR SILT.	(SP) ✓ CHANGE		0
	50-60'			43-50: LT BROWN SAND, GRAVEL, WGD, F GRAVEL, LITTLE C GRAVEL, M-C SAND, LITTLE F SAND.	(SW)		
				50-53': SAME AS ABOVE			
				53-55: BROWN GRAVELY SAND, WGD, C, GRAVEL, F.	(SW)		0
				55-60: LT BROWN SAND, WGD, C, SOME F GRAVEL, LITTLE M SAND, TR F SAND, TR COBBLES	(SW)		

FIELD BORING LOG				Boring No. PEP-91-01	
Project No. 06853-03		Project Name BANGER AAP		Page 2 of 4	
Contractor LAYNE		Driller RODRIGUEZ		Date started 10-12-91 completed 10-13-91	
Method DUAL WALL		Casing Size 9" O.D.		HNU 11.7/10.2	
Ground El		Soil Drilled 253.5		Protection Level 1	
		& below ground 95'		Total Depth 253.5'	
Logged by RRL		Checked by DRP		Date 10/16/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
	60-70'			LT BROWN GRAVELY SAND, WLD, C, F GRAVEL, LITTLE M SAND, TR C SAND, TR COBBLES.	(SW)	JAR/ATR	0
	70-80'			70-73' SAME AS ABOVE 73-80' LT BROWN SAND, WLD, C, LITTLE M SAND, LITTLE F GRAVEL, LITTLE F GRAVEL COBBLES, TR F SAND. INTERBEDS OF LARGE COBBLES (4"-6" IN DIA.)	(SW) ✓ CHANGE		0
	80-90'			80-83': SAME AS ABOVE 83-90': LT BROWN SAND, PLD, F, SOME SILT, TR M SAND, TR F GRAVEL	(SP)		0
	90-100'			SAME AS ABOVE	(SP) 92.8		0
	100-110			SAME AS ABOVE	(SP)		0
	110-120			LT BROWN SAND, PLD, M, SOME F SAND, TR C SAND, TR F GRAVEL, TR SILT	(SP)		0
	120-130'			120-129' LT BROWN SAND, WLD, M, SOME C, LITTLE F SAND, TR F GRAVEL.	(SW)		0
				129-130' LT BROWN SAND, WLD, M, SOME C, LITTLE F SAND, LITTLE F GRAV. TR GRAVEL COBBLES	(SW)		
	130-140			130-138 SAME AS 129-130	10-12-91 10-13-91		

FIELD BORING LOG				Boring No. PBP-91-01	
Project NO. 6453-03		Project Name BADGER AAP		Page 3 of 4	
Contractor LAYNE		Driller G. R. RIGUEZ		Date started 10-12-91 completed 10-13-91	
Method DUAL WALL		Casing Size 9" qb		HNU 11.7/10.2	
Ground EL		Soil Drilled 253.5		Protection Level 1	
		& below ground 95'		Total Depth 253.5'	
Logged by TCR		Checked by DRP		Date 10/16/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
	138-140			138-140: LT BR SAND, PUD, M-C, LITTLE F, TR F GRV, TR SILT	(SP)	JAR	ATR
	140-150			140-146: LT BROWN SAND, PUD, F, SOME M, TR C, TR SILT	(SP)	0	0
	=			146-150: LT BROWN SAND, F, WGD, SOME M, LITTLE C, TR F GRV, TR SILT	(SW)	0	0
	150-160			LT BROWN SAND, WGD, M, SOME C, LITTLE F GRV, LITTLE F SAND, TR SILT	(SW)	0	0
	160-170			SAME AS ABOVE	(SW)	0	0
	170-180			SAME AS ABOVE	(SW)	0	0
	180-190			180-185: SAME AS ABOVE	(SW)	0	0
				185-190: LT BROWN SAND, WGD, M-C, SOME F GRV, TR C GRV, TR COBBLES, TR SILT, TR F SAND	(SW)	0	0
	190-200			190-193: SAME AS ABOVE	(SW)	0	0
				193-198: LT BROWN GRAVELY SAND, WGD, SAND, M-C, GRAVEL, C,			
				198-200: LT BROWN SANDY GRAVEL, WGD, F-M, SAND, M-C, TR COBBLES, TR F SAND, TR SILT	(GW)		

NOTE:
IT IS A
DIFFICULT
DISTINCTION
BETWEEN
PUD AND WGD
IN THESE
SEDIMENTS

FIELD BORING LOG			Boring No. 73P-91-01	
Project No. 06253-03		Project Name BRIDGE AAP		Page 4 of 4
Contractor LAYNE		Driller G. RODRIGUEZ	Date started 10-12-91 completed 10-13-91	
Method WALK WALL	Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D	
Ground El	Soil Drilled 253.5	8' below ground 95'	Total Depth 253.5'	
Logged by TCRIC		Checked by DRP	Date 10/16/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
	200-210			200-205: LT BROWN GRAVELLY SAND, WGD, M-C, LITTLE F SAND, TR SILT GRAVEL F-M, TR COBBLES	(SW)	JAR	ATP
	210-220			210-216: LT BROWN GRAVELLY SAND, WGD, SAME AS ABOVE	(SW)		
				216-220: LT BROWN SANDY GRAVEL, WGD, F-M, SOME C GRAVEL, SAND: M-C, TR COBBLES, TR F SAND, TR SILT.	(FW)		
	220-230			220-223 LT BROWN GRAVELLY SAND, WGD, M-C, LITTLE F SAND, TR SILT, TR COBBLES, GRAVEL F-M.	(SW) ✓ CHANGE		
				223-230 LT BROWN, PWD SAND, M, LITTLE C, LITTLE F, TR F GRAVEL TR SILT	(SP)		
	230-240			SAME AS ABOVE	(SP)		
	240-250			240-247: LT BROWN SAND, PWD, M, LITTLE C, TR F GRAVEL	(SP)		
				247-250, LT BROWN SANDY GRAVEL, WGD, F-M, SAND: C-M, TR FINE, LITTLE COBBLES	(LW) ✓ CHANGE		
				B.O.B. - 253.5'			

FIELD BORING LOG				Boring No. PBP-91-02	
Project No. 6853-03		Project Name BANGOR AAP		Page 1 of 4	
Contractor LAYNE		Driller G ROEVER		Date started 10-13-91 completed 10-14-91	
Method DUAL WALL		Casing Size 9" O.D.		HNU 11.71102	
Ground El		Soil Drilled 253.5'		Protection Level D	
		8' below ground 95'		Total Depth 253.5'	
Logged by PRR		Checked by DRP		Date 10/16/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
	0-10'			BROWN CLAYEY SILT, PGD LITTLE F SAND	(ML) DONT HAVE FUNCTIONING HNU	JAR	ATR
	10-20'			LT BROWN SAND, PGD, F, LITTLE SILT, LITTLE M, TR COARSE, TR F GRAVEL, GRADUALLY CHANGING TO LT BROWN SAND, PGD, M, LITTLE F, TR C, TR GRAVEL COARSE GRAVEL - COBBLE ZONE, WGD, AT 12-13'	(SP)		
	20-30'			20-24': LT BROWN SAND, M, PGD, AS ABOVE 24-30': LT BROWN SAND, WGD, M, LITTLE C, LITTLE F SAND, TR F GRAVEL, TR SILT	(SP) CHANGE (SW)		
	30-40'			LT BROWN SAND, WGD, M, SOME C, LITTLE F, TR F GRAVEL, TR C GRAVEL, TR SILT	(SW)		
	40-50'			40-46': LT BROWN SAND, WGD, M-C, SOME F GRAVEL, LITTLE F SAND, TR SILT 46-50': LT BROWN GRAVELY SAND, WGD, C, SOME M, GRAVEL F, TR C, TR COBBLES	(SW)		
	50-60			50-55: BROWN SANDY GRAVEL, WGD, F, LITTLE C, SAND: C, LITTLE M, TR F, TR SILT 55-60: BROWN SANDY GRAVEL, WGD, C, SOME F, SAND: C SOME M, TR F	(SW)		

FIELD BORING LOG				Boring No. ^{PSP-91} B.C.1	
Project No. 0685303		Project Name <u>BADGER AAP</u>		Page <u>2</u> of <u>4</u>	
Contractor <u>Layne</u>		Driller <u>G. Rodriguez</u>		Date started <u>10-14-91</u> completed <u>10-15-91</u>	
Method <u>Dual Wall</u>	Casing Size <u>9" O.D.</u>	HNU <u>11.7102</u>	Protection Level <u>D</u>		
Ground El.	Soil Drilled <u>253.5'</u>	<u>8'</u> below ground <u>95'</u>	Total Depth <u>253.5'</u>		
Logged by <u>KKR</u>		Checked by <u>DRP</u>		Date <u>10/16/91</u>	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
	60-70			60-67': LT BROWN SAND WGD, C, SOME M, SOME F GRAVEL, TR C GRAVEL 67-70': LT BROWN SAND WGD TO PUD, M-C, TR F SAND, TR SILT, TR F GRAVEL, TR COBBLES.	(SW) TRIP OUT TO CHANGE FROM A CROWD-OUT TO A CROWD- IN BIT.	JAR/ATR	0
	70-80			LT BROWN SAND, WGD, C, SOME M SAND, LITTLE F SAND, LITTLE F GRAVEL, TR COBBLES	(SW)		0
	80-90'			LT BROWN SAND & PUD, M, LITTLE C, LITTLE F, TR F GRAVEL, TR COBBLES, TR SILT	(SP)		
	90-100'			LT BROWN SAND, PUD, F-M, LITTLE SILT, TR C SAND.	(SP)		
	100-110			SAME AS 90-100'	(SP)		
	110-120			LT BROWN SAND, PUD, M, LITTLE C, LITTLE F, TR F GRAVEL. (SP)	STARTED USING WATER DOWN CASING AT THIS POINT.		
	120-130			120-122: SAME AS 110-120' 122-127: LT BROWN SAND WGD, M, SOME C, LITTLE F, LITTLE F GRAVEL, TR COBBLES. 127-128': COBBLE-BOUNDED ZONE. 128-130': LT BROWN GRAVELY SAND, WGD, M-C, LITTLE F, GRAVEL: F-M, LITTLE COBBLES	✓ CHANGE (SW)		

FIELD BORING LOG				Boring No. <u>PBP-91-02</u> <u>B, C, D</u>	
Project No <u>06853-03</u>		Project Name <u>SANGER AAP</u>		Page <u>3</u> of <u>4</u>	
Contractor <u>LAYNE</u>		Driller <u>G. RODRIGUEZ</u>		Date started <u>10-14-91</u> completed <u>10-15-91</u>	
Method <u>DUAL WALL</u>		Casing Size <u>9" O.D.</u>	HNU <u>11.7/10.2</u>	Protection Level <u>D</u>	
Ground El.		Soil Drilled <u>253.5</u>	<u>±</u> below ground <u>95'</u>		Total Depth <u>253.5</u>
Logged by <u>DKR</u>		Checked by <u>DRP</u>		Date <u>10/16/91</u>	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
	130-140			130-136': LT BROWN GRAVELLY SANDS AS ABOVE	(SW)	JAR	ATR
				136-140': LT BROWN SAND, WGD, M-C, SOME F GRAVEL, LITTLE C GRAVEL, TR F SAND, TR SILT TR COBBLES			0
	140-150			LT BROWN SAND, WGD, M, SOME C, LITTLE F, LITTLE F GRAVEL, TR C GRAVEL, TR SILT.	(SW)		0
	150-160		150-156	SANDY GRAVEL, WGD, BROWN, F, SOME C GRAVEL, SAND: M-C, TR FINE, TR SILT	(SW)		0
				156-160': LT BROWN GRAVELLY SANDS, WGD, M-C, LITTLE F, GRAVEL: F, TR COBBLES	(SW)		
	160-170			LT BROWN SAND, PGL, M, SOME F, TR C, TR SILT	✓ CHANGE (SP)		0
	170-180			SAME AS 160-170	(SP)		0
	180-190			180-184': LT BROWN SAND, PGL, M, SOME C, TR F GRAV TR F SAND.	(SP)		
				184-190': LT BROWN SAND, WGD, M-C, LITTLE F GRAVEL TR F SANDS, TR SILT.	✓ CHANGE (SW)		
	190-200			190-197': SAND, WGD AS ABOVE.	~ PROBLEM W) HEAVING SANDS AT THIS POINT		
				197-200': LT BROWN SAND, WGD, C, SOME M, SOME F GRAVEL, TR C GRAVEL, TR COBBLES, TR F SAND, TR SILT	(SW)		
	200-210			SAME AS 197-200	(SW)		

FIELD BORING LOG			Boring No. <u>BBP-91-02</u> <u>B.C.</u>	
Project No. <u>06853-03</u>		Project Name <u>BADGER AAP</u>		Page <u>4</u> of <u>4</u>
Contractor <u>LAYNE</u>		Driller <u>G. T. RAINES</u>		Date started <u>10-14-91</u> completed <u>10-15-91</u>
Method <u>DUALWALL</u>	Casing Size <u>9" O.D.</u>	HNU <u>11.7/10.2</u>	Protection Level <u>D</u>	
Ground El.	Soil Drilled <u>253.5</u>	<u>±</u> below ground <u>95</u>	Total Depth <u>253.5</u>	
Logged by <u>RRC</u>		Checked by <u>DRP</u>		Date <u>10/16/91</u>

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
	210-220			210-215: LT BROWN GRAVELLY SAND, WGD, C. Some M, LITTLE F, TR SILT LITTLE COBBLES GRAVELLY F, LITTLE C. 215-220: LT BROWN SAND WGD, C, SOME M, SOME F GRAVEL, LITTLE F SAND TR SILT. TR COBBLES.	(SW)	JAR	ATR
	220-230			SAME AS 215-220	(SW) ✓ CHANGE		
	230-240			LT BROWN SAND, PGD, M, SOME C, LITTLE F SAND, TR F GRAVEL, TR SILT.	(SP)		
	240-250			240-248: SAME AS 230-240. 248-253: COBBLE-GRAVEL ZONE.	(SP) ✓ CHANGE (GW)		
				BOB = 253.5			

FIELD BORING LOG				Boring No. <u>PBN-91-06C</u>	
Project No. <u>06853-03</u>		Project Name <u>BADLER AAP</u>		Page <u>1</u> of <u>2</u>	
Contractor <u>LATWEL</u>		Driller <u>G. RODRIGUEZ</u>		Date started <u>10-16-91</u> completed <u>10-22-91</u>	
Method <u>DUAL WAVE</u>		Casing Size <u>9" O.D.</u>	MNU <u>11.7110.2</u>	Protection Level <u>D</u>	
Ground El.		Soil Drilled <u>220'</u>	<u>±</u> below ground <u>90'</u>	Total Depth <u>220'</u>	
Logged by <u>RRR</u>		Checked by <u>DRP</u>		Date <u>10/24/91</u>	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
	0-10'			BROWN CLAYEY SILT, P.G.D. TR F SAND, COHESIVE	(MD)	JAR AIR	
	10-20'			LT BROWN SAND, W.G.D, M, SOME F, SOME C, LITTLE F GRAVEL, TR SILT	(SW)		
	20-30'			INTERBEDDED LT BROWN SAND, W.G.D, C, SOME M, LITTLE F GRAVEL, TR SILT. TR C GRAVEL, TR F SAND; AND, LT BROWN SAND, P.G.D M, LITTLE C, LITTLE F, TR SILT.	(SW) (SP)		
	30-40'			SIMILAR TO 30-40'	(SW/SP)		
	40-50'	40-44		LT BROWN SAND, W.G.D, C, SOME F GRAVEL, LITTLE C GRAVEL, LITTLE M SAND, TR F, TR SILT.	(SW)		
		44-50		BROWN GRAVELY SAND, W.G.D, C, SOME M, TR F, TR SILT GRAVEL, F, LITTLE C, TR COBBLES			
	50-60'	50-54 54-58		SAME AS 44-50' LT BROWN SAND, W.G.D, C, SOME F GRAVEL, LITTLE M SAND, TR C GRAVEL, TR F SAND, TR SILT	(SW)		
		58-60		GRAVELY SAND AS 54-58'			
	60-70'			INTERBEDS OF LT BROWN SAND, W.G.D, C, SOME M, SOME F GRAVEL, LITTLE C GRAVEL AND; COBBLE ZONES	(SW)		

FIELD BORING LOG			Boring No. PRN-91-06	
Project No. 0653-03	Project Name BADER AAP		Page 1 of 1	
Contractor LAYNE	Driller G. RODRIGUEZ	Date started 10-12-91 completed 10-12-91		
Method Dual Wall	Casing Size 9" OD	HNU 11.71102	Protection Level D	
Ground El	Soil Drilled 251'	± below ground 83'	Total Depth 251'	
Logged by RRR	Checked by DRP	Date 10/14/91		

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		
						HNU	LEL	
S-1	0-10'			BROWN CLAYEY SILT, WLD, SOFT, MODERATE PLASTICITY	(ML)	0	0	0
S-2	10-20			10-12': SAME AS S-1 2-20': LT BROWN SAND, P.G.D., F. LITTLE M SAND, TR COARSE SAND, TR SILT. INTERBEDS OF SILT LENSES	(SP)	0	0	0
S-3	20-30'			LT BROWN SAND, P.G.D., F. LITTLE M SAND, TR COARSE, TR F GRAVEL, TR SILT	(SP)	0	0	0
S-4	30-40'			SAME AS S-3	(SP)	0	0	0
S-5	40-50'			LT BROWN GRAVELY SAND, WLD, M-C SAND, F-M GRAVEL, TR FINE SAND, TR SILT.	(SW)	0	0	0
S-6	50-60			LT BROWN SAND, WLD, M-C, SOME FINE GRAVEL, TR F SAND	(SW)	0	0	0
S-7	60-70			SAME AS S-6	(SW)	0	0	0
S-8	70-80'			70-73': 73-76': SAME AS S-6 73-76': COBBLE + BOULDER ZONE, 2"-6" DIAMETER, SOME FINE SAND 76-80': LT BROWN SAND, P.G.D., F, TR M SAND, TR SILT.	(SP)	0	0	0
S-9	80-90'			LT BROWN SAND, P.G.D., F, LITTLE M, TR COARSE SAND, TR F-M GRAVEL, TR SILT	(SP) - 83'	0	0	0

FIELD BORING LOG				Boring No. PBN-5	
Project No. 06853-03		Project Name BANGER AAP		Page 2 of 3	
Contractor LAYNE		Driller C. RODRIGUEZ		Date started 10-11-91 / completed 10-11-91	
Method DUAL WALL		Casing Size 9" O.D.	HNU 11.7110.2	Protection Level 1	
Ground El.		Soil Drilled 251'	2' below ground 83'	Total Depth 251'	
Logged by T.R.R.		Checked by DRP		Date 10/14/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-10	90-100'			SAME AS S-9	(SP)	JAR	ATR
S-11	100-110'			LT BROWN SAND, PGD, F, LITTLE M, LITTLE SILT	(SP)	0	0
S-12	110-120			110-112 = SAME AS S-9 112-120 = LT BROWN SAND PGD, F-M, TR COARSE, TR F-M GRAVEL, TR COBBLES	(SP)	0	0
S-13	120-130			120-122: SAME AS S-12 122-130: LT BROWN SANDY GRAVEL, WGD, F-M GRAVEL, M-C SAND, TRACE SILT LITTLE COBBLES	(GW)	0	0
S-14	130-140			130-137: LT BROWN SAND, PGD, F-M, LITTLE SILT	(SP)	0	0
S-15	140-150			137-140: LT BROWN SAND PGD, F-M, LITTLE COARSE, LITTLE F GRAVEL, TR COBBLES, TR SILT	(SP)	0	0
S-16	150-160			LT BROWN SAND, WGD, M, SOME FINE, LITTLE C, LITTLE F GRAVEL, TR COBBLES, TR SILT	(SW)	0	0
S-17	160-170			LT BROWN SAND, PGD, F-M, SOME C, TR F GRAVEL, TR SILT	(SP)	0	0
S-18	170-180			SAME AS S-16 LT BROWN SAND, WGD, M-C, SOME F SAND, LITTLE F GRAVEL, TR SILT	(SP) 170' SANDS HEAVING CHANGE TO CROWN-IN BIT (GW)	0	0

FIELD BORING LOG				Boring No. PDN-91-065	
Project No 06853-03		Project Name ISADUER AAP		Page 3 of 3	
Contractor LAYNE		Driller G RODRIGUEZ		Date started 10-11-91 completed 10-11-91	
Method DUAL WALL		Casing Size 9" O.D.		HNU 11.7/10.2	
Ground El		Soil Drilled 251'		Protection Level D	
		2' below ground 83'		Total Depth 251'	
Logged by JERR		Checked by DRP		Date 10/14/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-19	180-190			SAME AS S-18 (SW)	WATER IS DARK BROWN DUE TO SILT CONTENT		
S-20	190-200			SAME AS S-18 (SW)		0	0
S-21	200-210			200-206: LT BROWN SAND (SP) P.G.D, M, SOME F, LITTLE C SANDS, TR GRAVEL, TR SILT		0	0
				206-210: LT BROWN SAND (SW) W.G.D, M-C, SOME F GRAVEL		0	0
S-22	210-220			TR F SAND, TR SILT LT BROWN SAND, P.G.D, F.M (SP) LITTLE COARSE SAND, TR F GRAVEL, TR SILT		0	0
S-23	220-230			LT BROWN SAND, P.G.D, M (SP) SOME C SANDS, LITTLE F SANDS, TR SILT, TR GRAVEL		0	0
S-24	230-240			LT BROWN SAND, P.G.D, (SP) F, LITTLE M SAND, TR COARSE SAND, LITTLE SILT.		0	0
S-25	240-250			240-245: SAME AS S-24 (SP) 245-250: LT BROWN GRAVELY SANDS, W.G.D, M-C, LITTLE F SAND, GRAVEL IS F-C, TR (SW) LARGE COBBLES, TR SILT.		0	0
				BOE 250'			

FIELD BORING LOG				Boring No. <u>PBW-91-12C</u>	
Project No. <u>06853-03</u>		Project Name <u>BADGER AAP</u>		Page <u>1</u> of <u>3</u>	
Contractor <u>LAYNE</u>		Driller <u>G. RODRIGUEZ</u>		Date started <u>10-23-91</u> , completed <u>10-23-91</u>	
Method <u>DUAL WALL</u>		Casing Size <u>9" O.D.</u>		HNH <u>11.71/10.2</u>	
Ground El.		Soil Drilled <u>200'</u>		Z below ground <u>14'</u>	
Logged by <u>PRC</u>		Checked by <u>DRP</u>		Date <u>10/26/91</u>	
				Total Depth <u>200'</u>	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	HNH Jar	Comments on Advance of Boring	Monitoring HNH LEL	
0-10'		0-9'		BROWN CLAYEY SILT PUD, TR F SAND, COHESIVE.		(ML)	0	0
		9-10'		LT BROWN SAND, WLD, C, SOME M, LITTLE F, LITTLE F GRAVEL, TR SILT. THIN INTERBEDS OF C GRAVEL AND COBBLES		(SW)		
10-20				SAME AS ABOVE W/ THE THIN INTERBEDS OF COBBLES ENDING AT 14'		(SW)	0	0
20-30				LT BROWN SAND, PUD C, SOME M, SOME F, TR SILT, LITTLE F GRAVEL		(SP) ✓		
30-40				<u>30-32'</u> - LT BROWN SAND, WLD, C, SOME M, SOME F GRAVEL, LITTLE M SAND.		(SW)	0	0
				<u>32-40'</u> - LT BROWN SAND, PUD, M, SOME C, TR F GRAVEL, TR F SAND, TR SILT		(SP)		
40-50		40-44'		SAME AS 32-40'		(SP) (PR) ✓	0	0
		44-50'		LT BROWN SAND, WLD, C, SOME M, LITTLE F GRAVEL, TR C GRAV, TR F SAND, TR SILT		(SW)		
50-60				LT DARK BROWN SANDY GRAVEL; WLD, F, LITTLE C, SAND; C, SOME M, TR F. CHANGING TO GRAVELY SAND		(GW) (SW)	0	0

FIELD BORING LOG				Boring No. 784-91-120	
Project No. 06853-03		Project Name BADGER AAP		Page 2 of 3	
Contractor LAYNE		Driller G. BOCKWITZ		Date started 10-23-91, completed 10-23-91	
Method DUAL WALL		Casing Size 9" O.D.		HNU 11.7/10.2	
Ground El.		Soil Drilled 200'		7' below ground, 01'	
Logged by HCR		Checked by DWP		Date 10/26/91	
				Protection Level D	
				Total Depth 200'	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	HNU jar	Comments on Advance of Boring	Monitoring	
							HNU	LEL
60-70				LT BROWN SAND, WGD, M-C, LITTLE F GRAVEL, TR F SAND.		(SW)	0	0
70-80		70-75		LT BROWN SAND, PGD, M, LITTLE C, TR F.		(SP) ✓	0	0
		75-80		LT BROWN SAND, WGD, C, SOME M, LITTLE TO SOME F GRAVEL, TR COBBLES, TR CGRAV.		(SW)		
80-90		80-84		SAME AS 75-80		(SW) ✓	0	0
		84-90		LT BROWN SAND, PGD, M, SOME F, LITTLE C.		(SP)		
90-100				LT BROWN SAND, PGD, F, SOME M, LITTLE SILT		(SP)	0	0
100-110				SAME AS 90-100		(SP)	0	0
110-120				" " "		(SP)	0	0
120-130				" " "		(SP)	0	0
130-140				LT BROWN TO BROWN SANDY GRAVEL, AND GRAVELY SAND, WGD GRAVEL: F SOME TO LITTLE C, TR COBBLES SAND: M-C, LITTLE TO TR F, TR SILT		(SW) (SW)	0	0
140-150				LT BROWN SAND, WGD, C, SOME M, LITTLE F, LITTLE F GRAVEL.		(SW)	0	0
150-160				SAME AS ABOVE		(SW)	0	0
170-180 160-170	RA			" " "		(SW)	0	0

FIELD BORING LOG				Boring No. <u>PBN-91-12</u>	
Project No. <u>06853-03</u>		Project Name <u>BAOCCAL AAP</u>		Page <u>1</u> of <u>3</u>	
Contractor <u>LAYNE</u>		Driller <u>G. RODRIGUEZ</u>		Date started <u>10-15-91</u> completed <u>10-16-91</u>	
Method <u>DUALWALL</u>		Casing Size <u>9" O.D.</u>	HNU <u>11.7/10.2</u>	Protection Level <u>1</u>	
Ground El.		Soil Drilled <u>231'</u>	<u>2</u> below ground <u>101</u>	Total Depth <u>231.0</u>	
Logged by <u>KRIC</u>		Checked by <u>DRP</u>		Date <u>10/24/91</u>	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring HNU LEL	
S-1	0-10'			0-5': BROWN SILT, PGD, LITTLE F SANDS, TR COBBLES COHESIVE 5-10': LT BROWN SAND, WGD, M, SOME F SAND, SOME C, LITTLE F GRAVEL, TR COBBLES	(ML) (SW)	JAR	ATR
S-2	10-20'			LT BROWN SAND, WGD, M-C, SOME F, LITTLE F GRAVEL, TR COBBLES, TR SILT.	(SW)	0	
S-3	20-30'			LT BROWN SAND, M-C, PGD, LITTLE F, TR F GRAVEL	(SP)	0	
S-4	30-40'			LT BROWN SAND, FLOOR TO MOD GRADED, SIMILAR TO S-3. THIN INTERBEDS OF GRAVEL.	(SP)	0	
S-5	40-50'	40-47':		LT BROWN SAND, PGD, M, SOME C, LITTLE F, TR F GRAVEL.	(SP)	0	
		47-50':		BROWN SANDY GRAVEL WGD, F, LITTLE C SAND: SOME C, M, SOME F , SOME M, LITTLE F	✓ (GW) (RE)		
S-6	50-60'	50-55': 55-60'		SAME AS 47-50' LT BROWN GRAVELY SAND, WGD, C, SOME M, LITTLE F, GRAVEL FINE, TR C GRAV TR SILT.	(SW)	0	
S-7	60-70'			LT BROWN SAND, WGD, C, SOME M, SOME F GRAY, LITTLE F SAND, TR SILT, TR COBBLES.	(SW)	0	

FIELD BORING LOG				Boring No. <u>PSW-91-124</u>	
Project No. <u>06853-03</u>		Project Name <u>BARBER AAP</u>		Page <u>2</u> of <u>3</u>	
Contractor <u>LAYNE</u>		Driller <u>G. RODRIGUEZ</u>		Date started <u>10-25-91</u> completed <u>10-16-91</u>	
Method <u>Small Wall</u>	Casing Size <u>9" o.d.</u>	HNU <u>11.7/10.2</u>	Protection Level <u>1</u>		
Ground El.	Soil Drilled <u>231'</u>	<u>2</u> below ground/bi		Total Depth <u>231'</u>	
Logged by <u>RRR</u>		Checked by <u>DRP</u>		Date <u>10/24/91</u>	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-8	70'-80'	70-77'		LT BROWN SAND, PGD, C, SOME M, TR F SAND.	(SP)	JAR AIR	
		77-80		LT BROWN SAND, WGD, C, SOME F GRAVEL, LITTLE M SAND, TR COBBLE, TR F SAND, TR SILT.	(SW)		
S-9	80-90'			LT BROWN SAND, PGD, GRADING FROM M TO F W/DEPTH, LITTLE TO TR C SAND, TR COBBLES, LITTLE SILT.	(SP) CHANGE BITS		
S-10	90-100'			LT BROWN SAND, PGD, F, LITTLE M, LITTLE SILT, TR C, WLT	(SP) 101'		
S-11	100-110'			LT BROWN SAND, PGD, F, LITTLE SILT, LITTLE M SAND	(SP)		
S-12	110-120			SAME AS 100-110'	(SP)		
S-13	120-130			LT BROWN SAND, PGD, M, SOME F, LITTLE C, TR F GRAVEL	(SP) START PUMPING WATER DOWN HOLE TO SUPPRESS HEAVING SAND		
S-14	130-140			BROWN SANDY GRAVEL, WGD, F, LITTLE C GRAVEL GRADING TO SOME C GRAVEL. SAND: C, LITTLE M, LITTLE SILT, TR COBBLES.	(SW) WATER HAS BROWN COLOR		
S-15	140-150			LT BROWN SAND, WGD, C, SOME M, LITTLE F GRAVEL, TR F SAND, TR SILT	(SW)		
S-16	150-160	150-155		SAME AS 140-150	(SW)		
		155-160		LT BROWN SAND, WGD, C, LITTLE M, SOME F GRAVEL, TR F SAND, TR SILT			
S-17	160-170			SAME AS 155-160	(SW)		
S-18	170-180			LT BROWN SAND, WGD, C, SOME M, LITTLE F GRAVEL, TR F SAND, TR SILT	(SW)		
S-19	180-190			SAME AS S-19	(SW)		

FIELD BORING LOG				Boring No. PBW-91-120	
Project No. 06453-03		Project Name TADGUL AAP		Page 3 of 3	
Contractor LAYNE		Driller G. RODRIGUEZ		Date started 10-15-91 completed 10-16-91	
Method DUAL WALL		Casing Size 9" O.D.		HNU 11.71/10.2	
Ground El.		Soil Drilled 231'		Protection Level 8	
Logged by KCR		Checked by DRP		Date 10/24/91	
				Total Depth 231'	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-20	190-200			SAME AS S-18		JAR AIR	
S-21	200-210			LT BROWN SAND, P.D., M-C TR F GRAVEL, TR F SAND TR SILT	SP	0	
S-22	210-220	210-216 216-220		SAME AS S-21 BROWN GRAVELY SAND, W.G.D. C. SOME M, TR F, TR SILT TR COBBLES. GRAVEL: F, LITTLE C	SP SW	0	
S-23	220-230			LT BROWN SAND, W.G.D., M-C SOME F GRAVEL, TR SILT LITTLE F SAND, TR C GRAVEL	PROBLEM WITH HEAVING SANDS SW	0	
				BOE = 231'			

FIELD BORING LOG

BORING NO. PBN-8901 *ED*

PROJECT NO.: 5753-08

PROJECT NAME: USATHAMA-BAAP

PAGE 1 OF 2

DRILLING CONTRACTOR: LAYNE-NORTHWEST

DRILLER: G. Rodriguez

DATE STARTED 1/19/89

COMPLETED 1/20/89

METHOD: Dual Wall

CASING SIZE: *inner = 6" outer = 9 3/4"*

TIP QV: 10.0 TE

PROTECTION LEVEL: D

GROUND ELEV.: 871.5

SOIL DRILLED: 240'

WATER LEVEL: ~102'

TOTAL DEPTH: 240'

LOGGED BY: J. Snowden

CHECKED BY:

DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-1	0'-10'			Dr Br - Tan f si m-f sa w/ some med. gvl, moist, med. dense, well graded, nonplastic (SW)	0-5 topsoil	0	
S-2	10'-20'			similar to S-1			
S-3	20'-30'			Lt Br m-f sa w/ trace si & little med. ^{rounded} gvl, sl. moist, loose, p. graded, nonplastic, intermittent C gvl (SP)	Change @ 24'		
S-4	30'-40'			similar to S-3		0	
S-5	40'-50'			similar to S-3 w/ > gvl %		0	
S-6	50'-60'			Lt B m-f sa w/ trace to little si, & some ^{rounded} med. gvl, sl. moist, med. dense, poorly graded, nonplastic (SP)	Change to high gvl % @ 55'-57'		
S-7	60'-70'			similar to S-6 w/ > msa % (SP)		0	
S-8	70'-80'			similar to S-6 (SP)		0	
S-9	80'-90'			similar to S-6 (SP)			
S-10	90'-100'			similar to S-6 w/ < in the med. to C gvl % (SP)			
S-11	100'-110'			similar to S-6 w/ & some C gvl & cobbles (SP)	~ @ ~102'	0	
S-12	110'-120'			Lt Br m-f sa w/ trace si & little med. to f gvl, moist, loose, p. graded, nonplastic (SW)	Change @ 112'		
S-13	120'-120' ^{3'}			similar to S-12 w/ saturated moisture content			

FIELD BORING LOG

BORING NO. PB6N8901E0

NO.: 5753-08

PROJECT NAME: USATHAMA-BAAP

PAGE 2 OF 2

DRILLING CONTRACTOR: LAYNE-NORTHWEST

DRILLER: G. Rodriguez

DATE STARTED 1/19/89

COMPLETED 1/20/89

METHOD: Dual Wall

CASING SIZE:

inner = 6"
outer = 9 3/4"

TIP W: 10.0 TE#1

PROTECTION LEVEL: D

GROUND ELEV.: 871.5

SOIL DRILLED: 240'

WATER LEVEL: ~102'

TOTAL DEPTH: 240'

LOGGED BY: J. Snowden

CHECKED BY:

DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-14	130'-140'			similar to S-12.3		0	
S-15	140'-150'			similar to S-13 w/ fine gravel		0	
S-16	150'-160'			m. sandy gravel w/ some cobb, wet, loose, poorly graded, nonplastic (GP)	> in water yield from boring change @ 154'	0	
S-17	160'-170'			lt br f-m sa w/ little to trace si + trace med to f gravel, wet, loose, poorly graded, nonplastic (SW)	change @ 162'	0	
S-18	170'-180'			similar to S-17		0	
S-19	180'-190'			similar to S-17		0	
S-20	190'-200'			similar to S-17			
S-21	200'-210'			similar to S-17		0	
S-22	210'-220'			similar to S-17		0	
S-23	220'-230'			similar to S-17			
S-24	230'-240'			similar to S-17			
				BOB @ 240'			

FIELD BORING LOG				BORING NO. PBN-89-020	
PROJECT NO.: 5753-08		PROJECT NAME: USATHAMA- BAAP			PAGE 1 OF 3
DRILLING CONTRACTOR: LAYNE-NORTHWEST		DRILLER: G Rodriguez		DATE STARTED 3/18/89	COMPLETED 3/19/89
METHOD: hammering	CASING SIZE: 9"	TIP cv: Tip-7		PROTECTION LEVEL: D	
GROUND ELEV.: 894.5	SOIL DRILLED: 195'	WATER LEVEL: 120±		TOTAL DEPTH: 195'	
LOGGED BY: J.B.iss		CHECKED BY: J.B.		DATE: 3/18/89 3/24/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-1	0-10 ft			Black to dark brown fine silt grading to sand wt/depth Topsoil - Loess & outwash	Soil jammed in cyclone Topsoil 0-5.0 SM 5.0-10.0	0.0	
S-2	10-20 ft			light brown to reddish brown fine SAND wt/ some silt and little crse sand & gravel. dry. large gabbro boulder blown up at ~ 17 ft. gravel & cobbles to 20 ft. (SP)		0.6	
S-3	20-30 ft			Brown fine SAND and Gravel wt/ some cobbles. Dry (SP)		0.5	
S-4	30-40 ft			similar to S3 (SP)		0.2	
S-5	40-50			Brown - light brown fn-med SAND wt/ some gravel & occasional cobbles Dry (SP)		0.5	
S-6	50-60			light brown fn-med Sand wt/ coarse sand and well rounded gravel. FLINTY (SP) GLACIO-FLINTIAL		0.1	
S-7	60-70 ft			similar to S6 dry (SP)		0.3	
S-8	70-80 ft			similar to S6 dry (SP) grading to fine to crse Sand wt/ trace of fine gravel at 80 ft.	3/19/89 ↓	0.8	

3" BORE LOG				BORING NO. PBN-89-02C	
PROJECT NO.: 5753-06		PROJECT NAME: USATHANA-BAAP		PAGE 2 OF 3	
ILLING CONTRACTOR: LAYNE-NORTHWEST		DRILLER: G Rodriguez		DATE STARTED 3/18/89 COMPLETED 3/19/89	
METHOD: Hammer	CASING SIZE: 9 in	TIP W: TIP-7		PROTECTION LEVEL: 0	
LAND ELEV.: 894.5	SOIL DRILLED: 195'	WATER LEVEL: 1202		TOTAL DEPTH: 195'	
LOGGED BY: J. BUSS		CHECKED BY: JCB		DATE: 3/19/89 3/24/89	

HOLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
						TIP	LEL
S-9	80-90			light brown fine SAND wt little fine Gravel + Crse SAND dry-moist. fine-med gravel at 90 ft.		0.0	-
S-10	90-100			Brown fine-crse SAND and med-crse Gravel, subangular Till. Dry	(SP) change @ 100'	0.8	
S-11	100-110			Crse Sand and fine to crse Gravel. Dry	(SP)	0.7	
S-12	110-120			similar to S-11 wt. trace S. Sn-med Sand. Dry	(SP)		
				Sn-med Sand wt gravel at 118 ft.	✓ change @ 118'		
S-13	120-130			Sn-med Sand wt/ trace of gravel moist-wet	(SP)	0.3	
S-14	130-140			brown fine-med Sand wet.	(SP)	0.4	
S-15	140-150			similar to S-14 more medium Sand	(SP)	0.4	
S-16	150-160			brown fine-medium SAND with occasional med-crse gravel. wet.	(SP)	0.2	
S-17	160-170			similar to S-17	(SP)	0.4	

FIELD BORING LOG

BORING NO. PBN-89-028

PROJECT NO.: 5753-08

PROJECT NAME: USATNAMA-BAAP

PAGE 3 OF 3

RILLING CONTRACTOR: LAYNE-NORTHWEST

DRILLER: G. Rodriguez

DATE STARTED 3/18/89

COMPLETED 3/19/89

METHOD: hammer

CASING SIZE: 9" dual wall

TIP: TIP-7

PROTECTION LEVEL: D

GROUND ELEV.: 894.5

SOIL DRILLED: 195'

WATER LEVEL: 120±

TOTAL DEPTH: 195'

LOGGED BY: J. Buss

CHECKED BY: J.P.

DATE: 3/19/89 3/24/89

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-18	170-180			Brown fine-med SAND w/ occasional Gravel wet (SP)		0.5	
S-19	180-190			Brown fine-med SAND w/ little coarse SAND + trace gravel. wet (SP)		0.5	
S-20	190-200			Brown fine-med. SAND w/ little coarse sand and gravel. wet (SP)		0.5	
				195 ft. E.O.B. Over drilled to 210 after three try @ 195-200			

FIELD BORING LOG

BORING NO. PBN-89-04C

PROJECT NO.: 5733-08

PROJECT NAME: USATHAMA- SAAP

PAGE

OF 2

DRILLING CONTRACTOR: LAYNE-NORTHWEST

DRILLER: G. Roques

DATE STARTED

4/15/89

COMPLETED 4/16/89

METHOD: AP-1000

CASING SIZE: 9.0"

TIP SV: TE 10.6ev

PROTECTION LEVEL: D

GROUND ELEV.: 857.7

SOIL DRILLED: 190'

WATER LEVEL: \pm 87'

TOTAL DEPTH: 190'

LOGGED BY: BUSS

CHECKED BY: JSL

DATE: 4/26/89

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	CEL
S#1	0-10			Black organic silty topsoil and Brown silt (loess) to 5 ft, Tan Sn Sand wt/ occ gravel to DFT moist	TIP Bkgd = 0.0-0.5	0.1	
S#2	10-20			Sn - med SAND wt/ some crse sand + Sn - med gravel dry-moist (SP)		0.0	
S#3	20-30			Tan Sn - med SAND wt occasional gravel (well rounded) dry-moist. (SP)		0.2	
S#4	30-40			Same as S#3 (SP)		0.0	
S#5	40-50			Same as S#3 (SP)		0.1	
S#6	50-60			light brown Sn - Crse Sand wt/ Trce fine gravel dry-moist (SP)	↓ coarsening downward	0.3	
S#7	60-70			brown Med to Crse SAND wt/ some Sn Sand + Trce fine gravel (SP)	↓	0.1	
S#8	70-80			brown Med - Crse Sand and Med to Crse Gravel well rounded dry-moist (SP)	↓	0.0	
S#9	80-90			brown Med Sand wt some Crse Sand + occ. gravel + fine Sand (SP)		0.0	

FIELD BORING LOG

BORING NO. PBN-89-04

PROJECT NO.: 5733-06

PROJECT NAME: USATHAMA-BAAP

PAGE 2 OF 2

DRILLING CONTRACTOR: LAYNE-NORTHWEST

DRILLER: G. RODRIGUEZ

DATE STARTED 4/15/89

COMPLETED 4/15/89

METHOD: AP-1000 CASING SIZE: 9"

TIP W: TE 10.6 CV

PROTECTION LEVEL: D

GROUND ELEV.: 857.7

SOIL DRILLED: 190'

WATER LEVEL: ~87.5'

TOTAL DEPTH: 190'

LOGGED BY: Buss

CHECKED BY: JFL 4/16/89

DATE: 4/15/89

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
						TIP	LE.
S#10	90-100			Same as S#9 wet (SP)		0.0	
S#11	100-110			Brown fn-med SAND Tree silt. (SP)		0.0	
S#12	110-120			Same as S#11 (SP)		0.0	
S#13	120-130			Same as S#11 (SP)		0.0	
S#14	130-140			brown fn-med SAND w/ occasional angular gravel cobbles at 140 ft	v change @ 140	0.0	
S#15	140-150			Coarse - fn. Gravel w/ cobbles + a little fn crse Sand wet. (SP)		0.0	
S#16	150-160			Coarse Sand and gravel to 155 ft grades to Brown med-fn SAND w/ Tree crse SAND (SP)	v change @ 166'	0.0	
S#17	160-170			Brown Med-fn SAND with some Crse Sand and fine gravel at 168-170 ft. (SP)		0.0	
S#18	160-170 170-180			Brown fine Sand with some Med. Sand + Tree Silt. (SP)		0.0	
S#19	180-190			Brown med Sand w/ some fine crse Sand. + occasional gravel. (SP)		0.0	

Bottom of boring @ 190'

FIELD BORING LOG

BORING NO. PBM8905

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA-BAAP	PAGE 1 OF 1
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: L. Newman	DATE STARTED 3/2/89 COMPLETED 3/3/89
METHOD: H2A	CASING SIZE: 6.25"	TIP SV: TE #2 10.0eV PROTECTION LEVEL: D
GROUND ELEV.: 852.3	SOIL DRILLED: 90'	WATER LEVEL: 81.4' TOTAL DEPTH: 90'
LOGGED BY: J. Snowden	CHECKED BY: JEP.	DATE: 4/10/89

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-1	2'-4'		2.0 1.4	Dr Brown si m-fse w/ some m gvl + little Csa, moist, med. dense, poorly graded 0-5.0' Topsoil SP	Spoons were pushed w/ H2 rig rather than driven	0	
S-2	8'-10'		2.0 1.8	Tan f-m se w/ tral si + some med. gvl, dry, loose, p. graded nonplastic SP		0	
S-3	12'-20'		2.0 1.4	Similar to S-2 w/ 7 gvl %		0	
S-4	28'-30'		4.7 1.8	Similar to S-2 w/ fse seams		0	
S-5	38'-40'		2.0 1.3	Similar to S-2		0	
S-6	48'-50'	50 for S	1.5 1.3	Tan f-m sa w/ some Csa and, E gvl + cbs, dry-sl. moist, p. graded, loose, nonplastic SP	Spoon was taken w/ H2 rig hammer	0	
S-7	58'-60'		2.0 1.6	Similar to S-6 w/ 7 gvl + Csa 90	Spoon was pushed w/ the rig	8	
S-8	68'-70'		1.3 1.8	Similar to S-6 w/ C gvl + cbs 70		0	
S-9	78'-80'		1.4 1.0	Similar to S-8	NOT encountered	0	
S-10	88'-90'			sample not collected due to running sands	encountered @ 81'		
				BOB at 90.2'			

FIELD BORING LOG				BORING NO. PBM-89-07	
PROJECT NO.: 5753-		PROJECT NAME: USATHAMA- BAAP			PAGE 1 OF 1
DRILLING CONTRACTOR: LAYNE-NORTHWEST		DRILLER: Dallas		DATE STARTED 3/2/89	COMPLETED 3/3/89
METHOD: HSA	CASING SIZE: 6.25"	TIP cv:		PROTECTION LEVEL: D	
GROUND ELEV.: 846.6	SOIL DRILLED: 95 feet	WATER LEVEL: 77.2 feet bgs		TOTAL DEPTH: 95 feet	
LOGGED BY: B.K.B.		CHECKED BY:		DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
				0-2' bgs: black organic rich <u>topsoil</u> .			
				2-14' bgs: brown, sticky silt and fine sand. Moist <u>LOESS</u>			
				14-95' Well to Poorly graded fine to med. sand with little gravel - <u>outwash</u>			
				Note overdrilled to 110'			

FIELD BORING LOG

BORING NO. PBM-89-09

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA-BAAP	PAGE 1 OF 2
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: L. NEWMAN	DATE STARTED 2/22/89 COMPLETED 3/1/89
METHOD: 6.25" HSA	CASING SIZE: 6.25" I.D.	TIP GV: PROTECTION LEVEL: D
GROUND ELEV.: 880.6	SOIL DRILLED: 125'	WATER LEVEL: 110' ± TOTAL DEPTH: 125'
LOGGED BY: J. HENNER	CHECKED BY: JSP.	DATE:

JSP PBM

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
				No Samples collected from PBM-89-09 Logged borehole by action of HSA's	Note 0-5.0' (ML) Topsoil loose		
				0-10.0' Coarse gravel & many cobbles fairly drilling (SP)	✓ Change @ 10.0'		
				10.0' - 78' Smooth drilling (SP) Do not appear to have any cobbles or Boulders - Sand & Gravel most likely well sorted fine gravel & sand.	✓ Change @ 78'		
				78' - 97' Very difficult drilling numerous cobbles (SP) Very difficult drilling @ 97' Brake Hex Rods in HSA & Dropped Hex Rods Down the Borehole. While they to Recover, but will have to pull HSA out of Boring to get Hex Rods out.	2/28/89		
				2/28/89 Drillers Pull all Augers out of PBM-89-09 & Retrieve all Hex Rods. Apparently Pins vibrated out of the Hex Rods allowing them to come apart. Drillers Run HSA Back down to 85' & Backing for Lunch.			

NA
JSP 2/28/89

FIELD BORING LOG				BORING NO. DEM-87-09	
PROJECT NO.: 5733-08		PROJECT NAME: USATHANA-BAAP		PAGE 2 OF 2	
DRILLING CONTRACTOR: LAYNE-NORTHWEST		DRILLER: L. Newman		DATE STARTED 2/22/87 COMPLETED 3/1/87	
METHOD: 6.25" HSA	CASING SIZE: 6.25" ID	TIP GV:		PROTECTION LEVEL: D	
GROUND ELEV.: 880.6	SOIL DRILLED: 125'	WATER LEVEL: 108±		TOTAL DEPTH: 125'	
LOGGED BY: J. R. R. R.		CHECKED BY: J. R. R. R.		DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
						TIP	LEL
				<p>Drilling from 95-105' very difficult due many cobbles. MOST LIKELY ALSO CONCRETE GRAVEL & COBBLE SOME. @ 105' Drilling smooths out. Also out of HSA will get some HSA's from the front 22' Rg when they finish their work.</p> <p>4:30 20' of HSA from CRAT ARRIVE @ 6-10 Rg Drill from 105' to 110' smooth augering very easy.</p> <p>Drill from 110' to 115' very smooth augering no cobbles or boulders. 4:50</p> <p>Drill from 115' to 120' very smooth drilling does not appear to be doing anything</p> <p>2/1/87 7:45 AM</p> <p>Remove HSA Rats from Bottom H2O @ 105' Have 3 5' of "HSA" in Bottom of HSA In just 50 gallons H2O then drill to 125' casing depth open hole to 128' will now in stone not now in HSA.</p> <p>Dropped wall during installation see log book for details - Retrieved dropped wall</p>	<p>✓ Change @ 105' (SP) @ 105</p> <p>(SP)</p> <p>(SP)</p> <p>(SP)</p>		

FIELD BORING LOG

BORING NO. PBN-8710D

PROJECT NO.: 5753-	PROJECT NAME: USATAMA-BAAP	PAGE 1 OF 2
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: G. RODRIGUEZ	DATE STARTED 3/5/89 COMPLETED 3/7/89
METHOD: DUAL WALL	CASING SIZE: 9 1/2"	TIP DV: 0.00 PROTECTION LEVEL: D 4/29/89
GROUND ELEV.: 880.9	SOIL DRILLED: 255	WATER LEVEL: 115 TOTAL DEPTH: 255'
LOGGED BY: D.H. BELAN	CHECKED BY: JDA.	DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
						TIP	LEL
S-1	0-10'			DK BRN (SM) FROZEN, WITH LITTLE FINE GRAVEL	16' 50" 0-5.0'	0.00	
S-2	10-20'			MED BRN (SM), LOOSE, SLIGHTLY DAMP, WITH TRACE GRAVEL		0.00	
S-3	20-30'			MED BRN (SM) LOOSE, DAMP, TRACE GRAVEL	✓ 16' 30"	0.00	
S-4	30-40'			MED BRN MED BRN SM-SP WITH SOME GRAVEL		00.0	
S-5	40-50'			MED BRN (SP) WITH LITTLE GRAVEL LOOSE, MOIST		00.0	
S-6	50-60'			LT BRN (SF) WITH LITTLE GRAVEL		00.0	
S-7	60-70'			LT BRN (SF) WITH TR GRAVEL		00.0	
S-8	70-80'			LT BRN (SF) WITH SOME GW, WELL ROUNDED		00.0	
S-9	80-90'			(GW), WELL-MODERATELY ROUNDED WITH LITTLE LT BRN SF.	✓ @ 80'	00.0	
S-10	90-100'			(GW), WELL-MODERATELY ROUNDED WITH LITTLE LT BRN SF.	✓ @ 100'	00.0	
S-11	100-110'			LT BRN (SF) WITH SOME GW.		00.0	
S-12	110-120'			LT BRN (SF) WITH LITTLE GW. WET.		00.0	
S-13	120-130'			LT BRN (SF) WITH TRACE GW. WET		00.0	
S-14	130-140'			SIMILAR TO 9-13		0.00	
S-15	140-150'			LT BRN (SF) WET, TRACE GW.		00.0	
S-16	150-160'			LT BRN (SF) WITH SOME GW.		00.0	
S-17	160-170'			(GW) ROUNDED-ANGULAR, WITH ALTERNATING SF ZONES.	✓ @ 160'	00.0	
S-18	170-180'			(GW) TO ~175', THEN FLOWING "RUNNING" SAND, SF.	✓ @ 175'	00.0	
S-19	180-190'			LT BRN SF & GW, WITH LITTLE FINE GRAVEL		00.0	

FIELD BORING LOG				BORING NO. PBN-89-10 D	
PROJECT NO.: 5753-		PROJECT NAME: USATHAMA- BAAP			PAGE 2 OF 2
DRILLING CONTRACTOR: LAYNE-NORTHWEST		DRILLER: G. RODRIGUEZ		DATE STARTED 3/5/89 COMPLETED 3/7/89	
METHOD: DUAL WALL	CASING SIZE: 9 1/2"	TIP GV: 0.00		PROTECTION LEVEL: D 4/27/89	
GROUND ELEV.: 880.9	SOIL DRILLED: 255	WATER LEVEL: 115		TOTAL DEPTH: 255	
LOGGED BY: D.H. BELAN		CHECKED BY: <i>[Signature]</i>		DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
						TIP	LEL
S-20	190-200			LT BRN (SF) WET, TRACE FINE GRAVEL		00.0	
S-21	200-205			LT BRN (SF) WET, TRACE FINE GRAVEL		00.0	
				UNABLE TO CONTROL HEAVING SANDS. ABANDON HOLE.	4/19/89 Completion		
				Many cobble boulder zones to 190 ft.	Hole w/ BP-1000 ↓		
S#21	200-210			brown med-fn SAND, Trace Crse Sand + Silt. Occasional cobbles.		0.1	
S#22	210-220			similar to S#21		0.0	
S#23	220-230			Brown med-fn SAND, little Crse Sand and fine gravel. med-Crse Gravel layers at 230'		0.0	
S 24	230-240			Gray fn. Crse SAND wt occasion gravel + cobbles		0.0	
S 25	240-250			similar to S#24, less gravel + Crse sand		0.0	

FIELD BORING LOG

BORING NO. RBM-89-11

PROJECT NO.: 5753-	PROJECT NAME: USATHAMA- BAAP	PAGE 1 OF 1
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: Don	DATE STARTED 3/3/89 COMPLETED 3/7/89
METHOD: HSA	CASING SIZE: 6.25"	TIP cv: 10.0 cv PROTECTION LEVEL: d
GROUND ELEV.: 881.6'	SOIL DRILLED: 128 feet	WATER LEVEL: 185 144.89 feet bgs TOTAL DEPTH: 128 feet bgs
LOGGED BY: B. Butler	CHECKED BY:	DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
				<p>[No split spoons obtained] descriptions obtained from cuttings & behavior of HSA during drilling</p> <p>Encountered ± 6.0' loose - Tap soil</p> <p>50-75 feet fine to medium sand, well to poorly graded with variable fines, tr. gravel. tan (SP)</p> <p>75-78 feet: Gravel, cobbles } (GP) cobbles</p> <p>78-87.5' cobbles - auger being refused at 80 feet. } (GP)</p> <p>87.5-128' tan fine to medium sand with little co. sand, fine-med. gravel. (SP)</p>			
				<p>BOB @ 128'</p> <p>-Due to running sand the auger were removed from the original borehole and and off set bore hole was made ~ 15' west of the original boring. The offset boring was advanced to 125'.</p>			

FIELD BORING LOG

BORING NO. FBN-87-122

PROJECT NO.: 5753-

PROJECT NAME: USATHAMA- BAAP

PAGE 1 OF 2

DRILLING CONTRACTOR: LAYNE-WORTHWEST

DRILLER: G. Rodriguez

DATE STARTED 4/14/89

COMPLETED 4/15/89

METHOD: AP-1000

CASING SIZE: 9 in

TIP W:

PROTECTION LEVEL: D

GROUND ELEV.: 85.6

SOIL DRILLED: 140 ft

WATER LEVEL: 85 ft

TOTAL DEPTH: 140 ft

LOGGED BY: JAB

CHECKED BY: JAB 4/26/89

DATE: 4/14/89

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
						TIP	CE.
S1	0-10 ft			light brown to tan fm-coarse SAND w/ little fine angular gravel + silt. Dry	0-5.0 TOP SOIL		0.0
S2	10-20			light brown fm-med SAND w/ little coarse Sand + fm-med Gravel - Moist. (SP)			0.0
S3	20-30			Tan fine SAND w/ trace coarse Sand + fine gravel slightly moist. (SP)			0.0
S4	30-40			Same as S3 (SP)			0.0
S5	40-50			Same as S3 dry (SP)			0.0
S6	50-60			light brown fm-med SAND w/ little coarse Sand + fine gravel. slightly moist - dry (SP)			0.0
S7	60-70			Same as S6 (SP)			0.0
S8	70-80			light brown fm-med SAND, occasional Gravel slightly moist - dry (SP)			0.0
S-9	80-90			light brown med-coarse SAND w/ Gravel. + some fm. Silt. dry grading to moist - wet below 25 ft. (SP)			0.0

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The present of this form is MS40-ES)

PROJECT	<u>Badger AAP</u>	DATE	<u>11 and 14 Sep 88</u>
LOCATION	<u>South of Propellant</u>	DRILLERS	<u>20th Eng Bde</u>
	<u>Burning Ground</u>		<u>Geologist - Fox</u>
DRILL RIG	<u>Falling 1500</u>	BORE HOLE	<u>PBM-85-C1A</u>

(Feet) DEPTH	SAMPLE TYPE <u>BLOCKS</u> PER 6 IN.	DESCRIPTION	REMARKS
0		Silt, very dark brown	
		Silt, with very fine grained sand, tan	
		Sand, medium to coarse grained with fine gravel	
10			
20			
		Sand, medium to coarse grained and fine gravel	
30			

AEHA Form 130, 1 Nov 82

Revised May 1962 Form 72, 1-10-62, with 2-10-62

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The precedent of this form is MSMB-ES)

PROJECT Badger AAP DATE 14 Sep 85
 LOCATION South of Propellant DRILLERS 20th Eng Bde.
Burning Ground Geologist - Fox
 DRILL RIG Falling 1500 BORE HOLE PSN-85-01A

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
30		Same as above	
40		Sand, medium to coarse grained, with fine gravel (10%)	
50			
60			

AEHA Form 130, -1 Nov 82

Replaces MSMB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP DATE 14 Sep 85
 LOCATION South of Propellant DRILLERS 20th Eng Bde.
Burning Ground Geologist - Fox
 DRILL RIG Failing 1500 BORE HOLE PBN-85-01A

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
60			Drilling slower
		Sand, medium to coarse grained, gravel and cobbles	
70			
		Sand, medium to coarse grained and gravel	
80			
90			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 72, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The progenitor of this form is NSMB-83)

PROJECT Badger AAP DATE 15 Sep 85
 LOCATION South of Propellant DRILLERS 20th Eng Bde.
Burning Ground Geologist - Fox
 DRILL RIG Falling 1500 BORE HOLE P3M-85-01A

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
90		Same as above	
100		Sand, coarse to fine grained with 20% fine gravel	
110			
120			

AEHA Form 130, 1 Nov 82

Replaces NSMB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The progeny of this form is HSHB-ES)

PROJECT Badger AAP DATE 15 Sep 85
 LOCATION South of Propellant DRILLERS 20th Eng Bde,
Burning Ground Geologist - Fox
 DRILL RIG Falling 1500 BORE HOLE PBW-85-01A

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
120		Same as above	
130		Bottom of Hole	
140			
150			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 70, 1 Jan 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is NSMB-ES)

PROJECT Badger AAP DATE 1 Oct 85
 LOCATION South of propellant DRILLERS 20th Eng Bde.
Burning Ground Engineer - CPT Springer
 DRILL RIG Falling 1500 BORE HOLE PBN-85-02A

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
0		Clay with silt, medium brown-gray	
10		Sand with silt and some clay	
		Boulder	
20		Sand, medium to coarse grained and gravel	
30			

AEHA Form 130, 1 Nov 82

Replaces NSMB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP DATE 1 Oct 85
 LOCATION South of propellant DRILLERS 20th Eng Bde.
Burning Ground Engineer - CPT Springer
 DRILL RIG Falling 1500 BORE HOLE PSN-85-02A

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
30		Same as above	
40		Gravel, with sand	
		Sand, fine to medium grained, with gravel	
50		Sand, fine to medium grained	
		Gravel, with coarse to fine grained sand	
60			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is MSHB-ES)

PROJECT Badger AAP DATE 1 Oct 85
 LOCATION South of propellant DRILLERS 20th Eng Bde.
Burning Ground Engineer - CPT Springer
 DRILL RIG Falling 1500 BORE HOLE PSN-85-02A

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
60		Sand, medium to fine grained, with increasing gravel at base	
70			
80		Sand, coarse to fine grained	
90			

AEHA Form 130, 1 Nov 82

Replaces MSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP DATE 1 Oct 85
 LOCATION South of propellant DRILLERS 20th Eng Bde.
Burning Ground Engineer - CPT Springer
 DRILL RIG Falling 1500 BORE HOLE PSN-85-02A

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
90		Same as above	
100		Gravel, with sand, medium to coarse grained	
110			
120			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP DATE 1 Oct 85
 LOCATION South of propellant DRILLERS 20th Eng Bde.
Burning Ground Engineer - CPT Springer
 DRILL RIG Falling 1500 BORE HOLE PBN-85-02A

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
120		Same as above	
130			
140		Bottom of Hole	
150			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is NSHB-ES)

PROJECT Badger AAP DATE 3 Oct 85
 LOCATION South of Propellant DRILLERS 20th Eng Bde.
Burning Ground Engineer - CPT Springer
 DRILL RIG Failing 1500 BORE HOLE PRN-85-014

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
0		Clay with silt, dark brown	
10		Sand, coarse to fine grained	
20			
30			

AEHA Form 130, 1 Nov 82

Replaces NSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is MSHB-ES)

PROJECT Badger AAP DATE 3 Oct 85
 LOCATION South of Propellant DRILLERS 20th Eng Bde.
Burning Ground Engineer - CPT Springer
 DRILL RIG Falling 1500 BORE HOLE PSN-85-03A

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
30		Same as above	
40		Sand, coarse to medium grained	
50			
60			

AEHA Form 130, 1 Nov 82

Replaces MSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP DATE 3 Oct 85
 LOCATION South of Propellant DRILLERS 20th Eng Bde.
Burning Ground Engineer - CPT Springer
 DRILL RIG Falling 1500 BORE HOLE PSN-85-03A

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
60		Same as above	
70			
80			
90			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

(The proponent of this form is NSMB-ESI)

PROJECT Badger AAP DATE 3 Oct 85
LOCATION South of Propellant DRILLERS 20th Eng Bde.
Burning Ground Engineer - CPT Springer
DRILL RIG Falling 1500 BORE HOLE PBN-95-03A

[illegible]

AEHA Form T30, 1 Nov 82

Replaces NSM Form 72, 1 Jun 60, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The progenent of this form is MSHB-ES)

PROJECT Badger AAP DATE 30 Sep 85
 LOCATION South of Propellant DRILLERS 20th Eng Bde.
Burning Ground Engineer - CPT Springer
 DRILL RIG Failing 1500 BORE HOLE PBN-85-04A

(Feet) DEPTH	SAMPLE TYPE BLOWS PER 6 IN.	DESCRIPTION	REMARKS
0		Silt, dark brown	
		Clay with silt, medium brown	
10		Sand, fine to coarse grained	
20			
30			

AEHA Form 130, 1 Nov 82

Replaces MSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP DATE 30 Sep 85
 LOCATION South of Propellant DRILLERS 20th Eng Bde.
Burning Ground Engineer - CPT Springer
 DRILL RIG Falling 1500 BORE HOLE PSN-85-04A

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
30		Same as above	
40			
50		Send, medium to coarse grained, with gravel	
60			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is NSMB-ES)

PROJECT Badger AAP DATE 30 Sep 85
 LOCATION South of Propellant DRILLERS 20th Eng Bde.
Burning Ground Engineer - CPT Springer
 DRILL RIG Falling 1500 BORE HOLE PSN-85-04A

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
60		Same as above	
70			
80		Sand, fine to medium grained	
90			

AEHA Form 130, 1 Nov 82

Replaces NSMB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ESI)

PROJECT Badger AAP DATE 30 Sep 85
 LOCATION South of Propellant DRILLERS 20th Eng Bde,
Burning Ground Engineer - CPT Springer
 DRILL RIG Failing 1500 BORE HOLE PBN-85-04A

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
90		Same as above	
100			
110			
		Bottom of Hole	

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

FIELD BORING LOG

BORING NO. *DBN-39-123*

PROJECT NO.: *5733-08* PROJECT NAME: *USATHAMA-BAAP* PAGE *2* OF *2*
 DRILLING CONTRACTOR: *LAYNE-NORTHWEST* DRILLER: *Bill McNamee* DATE STARTED *4/14/89* COMPLETED *4/15/89*
 METHOD: *AP-1000* CASING SIZE: *9"* TIP GV: PROTECTION LEVEL: *D*
 GROUND ELEV.: *85.6* SOIL DRILLED: *140'* WATER LEVEL: *25'* TOTAL DEPTH: *140'*
 LOGGED BY: *D.S.* CHECKED BY: *J.R.* *4/26/89* DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 5-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
<i>S 10</i>	<i>90-100</i>			<i>Brown Fine-med SAND</i>			
				<i>Trace Crse Sand Wt (SP)</i>			<i>CC</i>
<i>S 11</i>	<i>100-110</i>			<i>Same as S 10</i>	<i>(SP)</i>		
<i>S 12</i>	<i>110-120</i>			<i>Same as S 10</i>	<i>(SP)</i>		
<i>S 13</i>	<i>120-130</i>			<i>Same as S 10</i>	<i>(SP)</i>		
<i>14</i>	<i>130-140</i>			<i>Same as S 10 130-133</i>			
				<i>133-140 Crse SAND</i>			
				<i>and Sn-Crse Gravel (SP)</i>			
				<i>140' BOE</i>			

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is MSHB-ES)

PROJECT Badger AAP DATE 22 Sep 85
 LOCATION South of Propellant DRILLERS 20th Eng Bde.
Burning Ground Geologist - Fox
 DRILL RIG Falling 1500 BORE HOLE PBM-85-01

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
0		Silt, dark brown	
		Silt and clay, tan	
10		Sand, fine to coarse grained and fine gravel	
20		Sand, medium to coarse grained and fine gravel	
30			

AEHA Form 130, 1 Nov 82

Replaces MSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP DATE 22 Sep 85
 LOCATION South of Propellant DRILLERS 20th Eng Bde.
Burning Ground Geologist - Fox
 DRILL RIG Falling 1500 BORE HOLE PBM-85-01

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
30		Same as above	
40			
50		Coarse to fine gravel with sand coarse to fine grained and cobbles	
60			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP DATE 22 Sep 85
LOCATION South of Propellant DRILLERS 20th Eng Bde.
Burning Ground Geologist - Fox
DRILL RIG Failing 1500 BORE HOLE PBM-85-01

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
60			
		Boulder	Drilling very slow
70		Gravel, coarse to fine, and sand, coarse to fine grained, with occasional cobbles	Gravel caving into hole
80			
90		Sand, fine to coarse grained, and fine to coarse gravel	

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is MSMB-ES)

PROJECT Badger AAP DATE 22 Sep 85
 LOCATION South of Propellant DRILLERS 20th Eng Bde.
Burning Ground Geologist - Fox
 DRILL RIG Failing 1500 BORE HOLE P3M-85-01

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
90		Same as above	
100			
110		Bottom of Hole	

AEHA Form 130, 1 Nov 82

Replaces MSMB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is MSHB-ES)

PROJECT Badger AAP DATE 17 Sep 85
 LOCATION South of Propellant DRILLERS 20th Eng Bde.
Burning Ground Geologist - Fox
 DRILL RIG Failing 1500 BORE HOLE PBM-85-02

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
0		Silt, very dark brown	
		Silt and sand, very fine grained, tan	
		Sand fine to coarse grained and fine gravel	
10			
20			
30			

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP DATE 17 Sep 85
 LOCATION South of Propellant DRILLERS 20th Eng Bde.
Burning Ground Geologist - Fox
 DRILL RIG Failing 1500 BORE HOLE PBM-85-02

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
30			
40		Gravel, coarse to fine with sand, medium to coarse grained and cobbles	Drilling slower
50		Gravel, coarse to fine and sand fine to coarse grained	
60			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP DATE 17 Sep 85
 LOCATION South of Propellant DRILLERS 20th Eng Bde.
Burning Ground Geologist - Fox
 DRILL RIG Failing 1500 BORE HOLE PBM-85-02

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
60			
70		Sand, fine to coarse grained and fine gravel	
80			
90			

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP DATE 17 Sep 85
 LOCATION South of Propellant DRILLERS 20th Eng Bde.
Burning Ground Geologist - Fox
 DRILL RIG Failing 1500 BORE HOLE PBM-85-02

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
90		Same as above	
100		Bottom of Hole	

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSMB-ES)

PROJECT Badger AAP DATE 18 Sep 85
 LOCATION South of Propellant DRILLERS 20th Eng Bde.
Burning Ground Geologist - Fox
 DRILL RIG Falling 1500 BORE HOLE PBM-85-03

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
0		Silt, very dark brown	Glacial Till (terminal moraine)
		Sand, fine to coarse grained, fine to coarse, gravel, some cobbles	
10			
20			
30			

AEHA Form 130, 1 Nov 82

Replaces HSMB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP DATE 18 Sep 85
 LOCATION South of Propellant DRILLERS 20th Eng Bde.
Burning Ground Geologist - Fox
 DRILL RIG Failing 1500 BORE HOLE PBM-85-03

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
30		Same as above	
40			
50		Sand, fine to coarse grained and coarse to fine gravel	
60			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is MSMB-ES)

PROJECT Badger AAP DATE 18 Sep 85
 LOCATION South of Propellant DRILLERS 20th Eng Bde.
Burning Ground Geologist - Fox
 DRILL RIG Failing 1500 BORE HOLE PBM-85-03

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
60		Same as above	
70			
80		Sand, fine to coarse grained, fine to coarse gravel and cobbles	Drilling slow
90		Sand, fine to coarse grained and fine to coarse gravel	

AEHA Form 130, 1 Nov 82

Replaces MSMB Form 78, 1 Jun 80, which will be used.

DRILLING LOG

(The proponent of this form is HSHB-ES)

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
90			Drilling slow, possible boulder
		Coarse to fine gravel, with sand, fine to coarse grained	
100			
110			
		Sand, fine to coarse grained, with fine gravel	
120			

Replaces NSMB Form 72, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP DATE 18 Sep 85
 LOCATION South of Propellant DRILLERS 20th Eng Bde.
Burning Ground Geologist - Fox
 DRILL RIG Falling 1500 BORE HOLE PBM-85-03

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
120		Same as above	
		Sand, very fine to coarse grained with fine gravel	
130		Sand, fine to coarse grained, and fine gravel	
140			
150		Bottom of Hole	

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP DATE 24 Sep 85
 LOCATION South of Propellant DRILLERS 20th Eng Bde.
Burning Ground Geologist - Fox
 DRILL RIG Failing 1500 BORE HOLE PBM-85-04

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
0		Silt, dark brown	
		Silt and clay with very fine grained sand, with gravel, tan	
		Coarse to fine gravel and sand, coarse to medium grained	
10			
		Sand, coarse to fine grained with fine gravel	
20			
30			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP DATE 24 Sep 85
 LOCATION South of Propellant DRILLERS 20th Eng Bde.
Burning Ground Geologist - Fox
 DRILL RIG Falling 1500 BORE HOLE PBM-85-04

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
30		Same as above	
40			
50			
60		Gravel, fine to coarse, sand, fine to coarse grained with occasional cobbles	

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSMB-ES)

PROJECT Badger AAP DATE 24 Sep 85
 LOCATION South of Propellant DRILLERS 20th Eng Bde,
Burning Ground Geologist - Fox
 DRILL RIG Falling 1500 BORE HOLE PBM-85-04

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
60			
70		Sand, fine to coarse grained, and fine gravel, occasional cobbles	
80			
90			

AEHA Form 130, 1 Nov 82

Replaces HSMB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP DATE 24 Sep 85
 LOCATION South of Propellant DRILLERS 20th Eng Bde.
Burning Ground Geologist - Fox
 DRILL RIG Falling 1500 BORE HOLE PBM-85-04

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
90			
100			
		Boulder	
		Sand, fine to coarse grained, with fine gravel	
110			
120			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 72, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSM B-ES)

PROJECT	<u>Badger AAP</u>	DATE	<u>24 Sep 85</u>
LOCATION	<u>South of Propellant</u>	DRILLERS	<u>20th Eng Bde.</u>
	<u>Burning Ground</u>		<u>Geologist - Fox</u>
DRILL RIG	<u>Falling 1500</u>	BORE HOLE	<u>PBM-85-04</u>

[illegible]

AEHA Form 130, 1 Nov 82

Replaces NSMB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP DATE 28 Sep 85
 LOCATION South of Propellant DRILLERS 20th Eng Bde.
Burning Ground Geologist - Fox
 DRILL RIG Failing 1500 BORE HOLE PBM-85-05

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
60			
		Gravel, coarse to fine and sand coarse to fine grained	
70			
80			
		Sand, fine to coarse grained with fine gravel	
90			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP DATE 28 Sep 85
 LOCATION South of Propellant DRILLERS 20th Eng Bde.
Burning Ground Geologist - Fox
 DRILL RIG Falling 1500 BORE HOLE PBM-85-05

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
90		Same as above	
100			
110		Bottom of Hole	
120			

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is MSHB-E5)

PROJECT Badger AAP DATE 4 Oct 85
 LOCATION South of Propellant DRILLERS 20th Eng Bde.
Burning Ground Engineer - CPT Springer
 DRILL RIG Falling 1500 BORE HOLE PBM-85-06

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN		
0		Silt, with clay dark brown	
		Silt with clay, medium brown	
10			
		Sand, fine grained, with gravel	
20			
30			

AEHA Form 130, 1 Nov 82

Replaces MSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP DATE 4 Oct 85
 LOCATION South of Propellant DRILLERS 20th Eng Bde,
Burning Ground Engineer - CPT Springer
 DRILL RIG Failing 1500 BORE HOLE PBM-85-06

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
30		Same as above	
40			
50		Gravel, coarse to fine, and cobbles, with sand	
60		Gravel, coarse to fine, with sand	

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

PROJECT Badger AAP DATE 4 Oct 85
 LOCATION South of Propellant DRILLERS 20th Eng Bde.
Burning Ground Engineer - CPT Springer
 DRILL RIG Falling 1500 BORE HOLE PBM-85-06

(Feet) DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	BLOWS PER 6 IN.		
60		Same as above	
70			
80		Sand, medium grained, with gravel	
90		Bottom of Hole	

AEHA Form 130, 1 Nov 82

Replaces HSHB Form 78, 1 Jun 80, which will be used.

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. PBM-82-01Surface Elevation 855.7Job No. C 10313Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		Moisture		N	Depth		q _n	W	LL	PL	D
No.	Type	↓	↓								
1	SS	13"	M	5	*	Stiff to Very Stiff, Black (5Y 2.5/1) Clayey SILT (ML)	(2.0)				
2	SS	18"	M	7	5	**					
3	SS	18"	M	11		Medium Dense, Pale Yellow (2.5Y 7/4) Fine to Coarse SAND, Trace to Little Silt & Clay, Some Fine Gravel (SP-SM)					
4	SS	17"	M	19	10						
5	SS	18"	M	15	15						
6	SS	18"	M	20	20						
7	SS	15"	M	20	25						
8	SS	12"	M	19	30	Boring Completed to 30' on 2/10/82	()	Pocket Penetrometer Reading, TSF			
					35	* 2.0' of Frost Present					
					40	**Loose, Dark Yellowish Brown (10YR 4/6) Fine SAND, Some Silt & Clay, Trace of Medium Sand (SM)					
					45						

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. PBM-82-01Surface Elevation 855.7Job No. C 10313Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		Moisture		N	Depth		q _s	W	LL	PL	D
No.	Type	↓	↓								
						Boring Completed from 30' - 100' on 3/18/82 Unit: SAMS-2 Chief: Larry F. Very Dense, Yellowish Brown (10YR 5/4) Fine to Coarse SAND, Trace to Little Silt & Clay, Some Fine Gravel (SP-SM)					
					50						
9	SS	18"	M	129	55						
					60						
					65						
					70						
					75						
10	SS	18"	M	122	80	Very Dense, Light Yellowish, Brown (10YR 6/4) Fine to Medium SAND, Trace Silt (SP)					
					85						
					90						

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, Wisconsin

PBM-82-01

Boring No.

Surface Elevation 855.7Job No. C 10313Sheet 3 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				q _u	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
						Medium Dense, Yellowish Brown (10YR 5/4) Fine to Medium SAND, Trace Silt (SP)					
					95						
11	SS	18"	W	16	100						
						End Boring at 100'					
					105						
					110						
					115						
					120						
					125						
					130						
WATER LEVEL OBSERVATIONS						GENERAL NOTES					
While Drilling _____						Start <u>2/10/82</u> Complete <u>3/18/82</u>					
Upon Completion of Drilling _____						Crew Chief <u>JWG/MG</u> Rig <u>55-1</u>					
Time After Drilling <u>1/2</u> hour _____						Drilling Method <u>CS 0-10'</u>					
Depth to Water _____						FA <u>10-30'</u>					
Depth to Cave In <u>30.0'</u> Moist _____						DM/WO <u>30-100'</u>					

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. PBM-82-02Surface Elevation 870.9Job No. C 10313Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9838, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	Type	Recovery ↓	Moisture ↓	N	Depth		W	LL	PL	D	
1	SS	18"	M	-	*	12" TOPSOIL					
2	SS	18"	M	12		Very Stiff, Dark Brown (10YR 3/3) Silty CLAY (CH)	(2.2)				
3	3"ST	12"	M	-	5	Shelby Tube Hydraulically Pushed at 100 PSI from 3'-5'		52.3	25.8		
4	SS	18"	M	11		**					
5	SS	24"	M	49	10						
6	SS	18"	M	26	15	Medium Dense to Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Medium SAND, Trace to Little Silt & Clay, Little Coarse Sand & Fine Gravel (SP-SM)					
7	SS	18"	M	52	20						
8	SS	6"	M	37	25						
9	SS	4"	M	44	30	Some Fine Gravel Encountered at 29' Boring Completed to 30' on 2/10/82	()			Pocket Penetrometer Reading, TSF	
					35	* 1' of Frost Present					
					40	**Medium Dense, Dark Brown (10YR 3/3) Fine SAND, Some Silt & Clay, Trace of Medium Sand (SC)					
					45						

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. PBM-82-02Surface Elevation 870.9Job No. C 10313Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture				q _s	W	LL	PL	O	
No.	Type	↓	↓	N	Depth							
					50	Boring Completed from 30' to 115' on 3/17/82 Unit: SAMS-1 Chief: Larry F. Very Dense, Light Yellowish Brown (10YR 6/4) Fine to Medium SAND, Trace Silt, Trace Gravel (SP)						
10	SS	18"	M	106	55							
					60							
					65							
					70							
					75							
					80							
11	SS	18"	M	120	85		Very Dense, Yellowish Brown (10YR 5/4) Fine to Coarse SAND, Some Gravel, Trace Silt, Occasional Cobbles (SP)					
					90							

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. PBM-82-02Surface Elevation 870.9Job No. C 10313Sheet 3 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				q _v	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
						Very Dense, Light Yellowish Brown (10YR 6/4) Fine to Medium SAND, Trace Silt, Trace Gravel (SP)					
12	SS	18"	W	173	115	End Boring at 115'					
WATER LEVEL OBSERVATIONS						GENERAL NOTES					
While Drilling _____						Start <u>2/10/82</u> Complete <u>3/17/82</u>					
Upon Completion of Drilling _____						Crew Chief <u>LS</u> Rig <u>55-2</u>					
Time After Drilling <u>1/2 hour</u>						Drilling Method <u>CS 0-10'</u>					
Depth to Water _____						FA <u>10-30'</u>					
Depth to Cave In <u>28'M</u>						DM/VO <u>30-115'</u>					



Project Badger Army Ammunition Plant

LocationBaraboo, Wisconsin.....

Surface Elevation 862.7

Job No. C 10313

Sheet1..... of3.....

1409 EMIL STREET • P.O. BOX 9536, MADISON, WIS. 53715 • TEL. (608) 257-4848

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project **Badger Army Ammunition Plant**
 Location **Baraboo, Wisconsin**

Boring No. **PBM-82-03**Surface Elevation **862.7**Job No. **C 10313**Sheet **2** of **3**

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	Type	Recovery ↓	Moisture ↓	N	Depth		q _u	W	LL	PL	D
						Boring Completed from 30' to 107' on 3/16/82 Unit: SAMS-1 Chief: Larry F. Very Dense, Light Yellowish Brown (10YR 6/4) Fine to Medium SAND, Trace Silt, Trace Gravel (SP)					
					50						
9	SS	18"	M	177	55						
					60						
					65						
					70						
					75						
10	SS	18"	M	130	80	Very Dense, Yellowish Brown (10YR 5/4) Fine to Medium SAND, Little Silt, Trace Gravel (SP-SM)					
					85						
					90						

(Continued)



LOG OF TEST BORING

Location Baraboo, Wisconsin

Sheet 3 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				q _a	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
					95	Very Dense, Yellowish Brown (10YR 5/4) Fine to Medium SAND, Trace Silt, Trace Gravel (SP)					
					100						
					105						
11	SS	12"	W	132	110						
					115						
					120	End Boring at 107'					
					125						
					130						
WATER LEVEL OBSERVATIONS						GENERAL NOTES					
While Drilling _____						Start 2/10/82 Complete 3/16/82					
Upon Completion of Drilling _____						Crew Chief JWG/MG Rig 55-1					
Time After Drilling ½ hour _____						Drilling Method CS 0-10'					
Depth to Water _____						FA 10-30'					
Depth to Cave In 30.0' Moist _____						DM/NO 30-TC7					

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. PBM-82-04Surface Elevation 869.0Job No. C-10313Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				W	LL	PL	D	
No.	Type	↓	↓	N	Depth						
1	SS	18"	M	10		Stiff, Dark Brown (10YR 3/3) Silty CLAY (CL)	(1.4)				
2	SS	18"	M	7	5	Loose to Dense, Yellowish Brown (10YR 5/4) Fine to Coarse SAND, Some Silt & Clay, Some Gravel (SM)					
3	SS	18"	M	24							
4	SS	18"	M	80 76"	10						
5	SS	18"	M	20	15	Medium Dense to Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Coarse SAND, Some Silt & Clay, Trace of Gravel (SM)					
6	SS	18"	M	28	20						
7	SS	18"	M	32	25						
8	SS	16"	M	54	30	Encountered More Gravel & Less Silt from 25' - 30'					
					35	Boring Completed to 30' on 2/15/82	() Pocket Penetrometer Reading, TSF				
					40						
					45						

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. PBM-82-04
Surface Elevation 869.0
Job No. C.10313
Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		Moisture		N	Depth		q _s	W	LL	PL	D
No.	Type	↓	↓								
						Boring Completed from 30' to 113' on 3/16/82 Unit: SAMS-2 Chief: Larry F. Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Medium SAND, Little Silt, Trace Gravel (SP-SM)					
					50						
9	SS	9"	W	82	55						
					60						
					65						
					70						
					75						
						Very Dense, Yellowish Brown (10YR 5/4) Fine to Coarse SAND and GRAVEL, Little Silt (SP-SM)					
10	SS	48"	M	91	80						
					85						
					90						

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. PBM-82-04Surface Elevation 869.0Job No. C 10313Sheet 3 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		Moisture		N	Depth		q _s	W	LL	PL	D
No.	Type	↓	↓								
					95						
					100						
					105						
					110						
11	SS	18"	W	100		Very Dense, Yellowish Brown (10YR 5/4) Fine to Coarse SAND, Some Gravel, Little Silt (SP-SM)					
					115	End Boring at 113'					
					120						
						No Mud Loss During Drilling Operation					
					125						
					130						
WATER LEVEL OBSERVATIONS						GENERAL NOTES					
While Drilling _____						Start <u>2/15/82</u> Complete <u>3/16/82</u>					
Upon Completion of Drilling _____						Crew Chief <u>WG/MC</u> Rig <u>55-1</u>					
Time After Drilling <u>1/2 hour</u>						Drilling Method <u>CS 0-10'</u>					
Depth to Water _____						FA <u>10-30'</u>					
Depth to Cave In <u>28.2' Moist</u>						DM/WO <u>30-113'</u>					



ENGINEERING INC

LOG OF TEST BORING

Project Badger Army Ammunition Plant

Location Baraboo, Wisconsin

Boring No. PBM-82-05

Surface Elevation 873.7

Job No.C..10313

Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES						
Recovery		↓	Moisture		N		Depth	q _n	W	LL	PL	D	
No.	Type		↓	↓									
1	SS	18"	M	6		10" TOPSOIL Stiff, Dark Brown (10YR 3/3) Silty CLAY (CL)	(1.5)						
2	SS	18"	M	6	5	*							
3	SS	18"	M	38		Dense to Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Coarse SAND, Some Silt & Clay, Some Gravel (SM) Occasional Cobbles at 7.5'							
4	SS	16"	M	52	10								
5	SS	18"	M	41	15								
6	SS	12"	M	52	20								
7	SS	8"	M	62	25	Dense to Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Coarse SAND and GRAVEL, Little Silt & Clay (SP-SM) Boring Completed to 30' on 2/15/82 * Loose, Dark Brown (10YR 3/3) Fine to Medium SAND, Some Silt & Clay, Some Gravel (SC)							
8	SS	12"	M	45	30								



Sheet 2 of 3

(Continued)



LOG OF TEST BORING

Location Baraboo, Wisconsin

Boring No. 873.7
Surface Elevation

Sheet 3 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				q _u	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
						<p>Very Dense, Light Yellowish Brown (10YR 6/4) Fine to Medium SAND, Little Gravel, Little Silt (SP-SM)</p> <p>End Boring at 121.5'</p>					
					95						
					100						
					105						
					110						
					115						
11	SS	18"	W	177	120						
					125						
					130						
WATER LEVEL OBSERVATIONS						GENERAL NOTES					
While Drilling _____						Start <u>2/15/82</u> Complete <u>3/17/82</u>					
Upon Completion of Drilling _____						Crew Chief <u>JWG/MC</u> Rig <u>55-1</u>					
Time After Drilling <u>½ hour</u> _____						Drilling Method <u>CS 0-10'</u>					
Depth to Water _____						FA <u>10-30'</u>					
Depth to Cave In <u>29.0'</u> Moist _____						DM/WO <u>30-121.5'</u>					



**ENGINEERING INC**

LOG OF TEST BORING

Project Badger Army Ammunition Plant.....

LocationBaraboo, Wisconsin.....

Boring No. PBN-82-01A

Surface Elevation 881.5...

Job No.C...10313

Sheet 2 of 3

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				q _v	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
					50	Boring Completed from 30'-115' on 3/18/82 Unit: SAMS-1 Chief: Larry F.					
9	SS	18"	M	141	55	Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Medium SAND, Trace to Little Silt (SP-SM)					
					60						
					65						
					70						
					75						
10	SS	18"	M	185	80	Very Dense, Yellowish Brown (10YR 5/4) Fine to Coarse SAND and GRAVEL, Little Silt, Occasional Cobbles (SP-SM) Drove a Boulder at 79'					
					85						
					90						

(Continued)

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WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. PBN-82-01ASurface Elevation 881.5Job No. C 10313Sheet 3 of 3

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				Qu	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
						Very Dense, Yellowish Brown (10YR 5/4) Fine to Medium SAND, Trace Silt (SP)					
11	SS	18"	M	101	115	End Boring at 115'					
WATER LEVEL OBSERVATIONS						GENERAL NOTES					
While Drilling _____						Start <u>2/16/82</u> Complete <u>3/18/82</u>					
Upon Completion of Drilling _____						Crew Chief <u>JWG/MG</u> Rig <u>55-1</u>					
Time After Drilling <u>1/2</u> hour _____						Drilling Method <u>CS 0-10'</u>					
Depth to Water _____						FA <u>10-30'</u>					
Depth to Cave In <u>26'</u> Moist _____						DM/VO <u>30-115'</u>					

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, Wisconsin

PBN-82-01B

Boring No. PBN-82-01BSurface Elevation 881.5Job No. C-10313Sheet 1 of 1

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		Moisture		N	Depth		q _u	W	LL	PL	D
No.	Type	↓	↓								
						150 Gallons of Drilling Mud Loss between 20' - 30' NOTE: For more detailed subsurface information, refer to Log of Test Boring No. PBN-82-01A					
						300 Gallons of Drilling Mud Loss between 90' - 100'					
						End Boring at 129'					
WATER LEVEL OBSERVATIONS						GENERAL NOTES					
While Drilling _____						Start <u>3/10/82</u> Complete <u>3/10/82</u>					
Upon Completion of Drilling _____						Crew Chief <u>LF</u> Rig <u>SAMS-2</u>					
Time After Drilling _____						Drilling Method _____					
Depth to Water _____						<u>DM-Q-129'</u>					
Depth to Cave In _____											

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LOG OF TEST BORING

Project Badger Army Ammunition Plant

Location Baraboo, Wisconsin

PBN-82-02A

Boring No. PBN-82-UZA

Surface Elevation 882.9

Job No.C.10313.....

Sheet 1 of 3

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				q _n	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
1	SS	18"	M	14	*	10" TOPSOIL					
						Stiff to Very Stiff, Dark Yellowish Brown (10YR 3/3) Silty CLAY (CH)	(2.2)				
2	3"ST	24"	M	-		Shelby Tube Pushed Hydraulically at 900 PSI	(1.2)				
3	SS	18"	M	7		**					
4	SS	18"	M	100/4	10	Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Coarse SAND & GRAVEL, Little Silt & Clay (SM-SW)					
5	SS	18"	M	143	15						
6	SS	18"	M	44	20	Dense to Very Dense, Pale Yellow (2.5Y 7/4) Fine SAND, Little Silt & Clay, Some Medium Sand (SP-SM)					
7	SS	18"	M	84	25						
8	SS	-	M	100/8	30	No Recovery at 30'					
						Boring Completed to 30' on 2/10/82	()	Pocket Penetrometer Reading, TSF			
						* 1.5' of Frost Present					
						**Loose, Dark Brown (10YR 3/3) Fine SAND, Some Silt & Clay, Little Medium Sand, Trace Coarse Sand (SC)					
					35						
					40						
					45						

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LocationBaraboo, Wisconsin.....

Boring No. **PBN-82-02A**
 Surface Elevation **882.9**
 Job No. **C 10313**
 Sheet **2** of **3**

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		Moisture					q _n	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
						Boring Completed from 30' - 116' on 5/1/82 Unit: SAMS-2 Chief: Tom O.					
9	SS	18"	M	48	55	Dense, Very Pale Brown (10YR 7/3) Fine to Medium SAND, Trace Gravel, Trace Silt (SP)					
					60						
					65						
					70						
					75						
10	SS	24"	M	91	80	Very Dense, Light Yellowish Brown (10YR 6/4) Fine to Coarse SAND, Some Gravel, Trace Silt (SP)					
					85						
					90						

(Continued)

(Continued)



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LOG OF TEST BORING

Project Badger Army Ammunition Plant

Location Baraboo, Wisconsin

Boring No. PBN-82-02A

Surface Elevation ..882.9.

Job No. C 10313

Sheet 3 of 3

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture				q _u	W	LL	PL	D	
No.	Type	↓	↓	N	Depth							
					95	Very Dense, Pale Brown (10YR 6/3) Fine to Medium SAND, Trace Silt (SP)						
					100							
					105							
					110							
					115							
11	SS	18"	M	62			End Boring at 116'					
					120							
					125							
					130							
WATER LEVEL OBSERVATIONS						GENERAL NOTES						
While Drilling _____						Start <u>2/10/82</u> Complete <u>5/1/82</u>						
Upon Completion of Drilling _____						Crew Chief <u>LS</u> Rig <u>55-2</u>						
Time After Drilling <u>1/2 hour</u> _____						Log Method <u>CS 0-10'</u>						
Depth to Water _____						10-30'						
Depth to Cave In <u>26' M</u> _____						/WO 30-116'						



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LOG OF TEST BORING

Project Badger Army Ammunition Plant

Location Baraboo, Wisconsin.....

Boring No. PBN-82-028.....

Surface Elevation ...882.9

Job No. C 10313

Sheet 1 of 1

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		Moisture		N	Depth		q _s	W	LL	PL	D	
No.	Type	↓	↓									
						NOTE: For more detailed subsurface information, refer to Log of Test Boring No. PBN-82-02A						
					40							
					80	No Water Loss - Used 7 Bags of Well Gell						
					120	End Boring at 129.5'						

WATER LEVEL OBSERVATIONS

While Drilling _____

Upon Completion of Drilling _____

Time After Drilling _____

Depth to Water _____

Depth to Cave In _____

GENERAL NOTES

Start 3/8/82 Complete 3/8/82

Crew Chief LF Rig SAMS-1

Drilling Method DM 0-129.5'



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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				q _s	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
						NOTE: For more detailed subsurface information, refer to Log of Test Boring No. PBN-82-02A 110 Gallons of Drilling Mud Loss from 40' - 60'					
						End Boring at 139'					

WATER LEVEL OBSERVATIONS						GENERAL NOTES	
While Drilling _____						3/9/82	3/9/82
Upon Completion of Drilling _____						Start	Complete
Time After Drilling _____						Crew Chief	LF Rig SAMS-1
Depth to Water _____						Drilling Method	DM 0-139'
Depth to Cave In _____							

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. PBN-82-03ASurface Elevation 857.6Job No. C 10313Sheet 1 of 3

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				G	W	LL	PL	D
No.	Type	↓	↓	M	Depth						
1	SS	M	18"	26	*	12" TOPSOIL					
2	SS	M	18"	6	5	Stiff to Very Stiff, Dark Brown (10YR 3/3) Silty CLAY (CH)	(2.0)				
3	3"ST	M	7"	-	5	**					
4	SS	M	12"	10	10	Loose to Dense, Light Olive Brown (2.5Y 5/4) Fine to Coarse SAND, Trace of Silt & Clay, Little to Some Fine to Coarse Gravel (SP)					
5	SS	M	18"	30	15	Color Change at 15' to Light Yellowish Brown (2.5Y 6/4)					
6	SS	M	6"	22	20						
7	SS	M	12"	41	25						
8	SS	M	12"	41	30						
					35	Boring Completed to 30' on 2/11/82					
					40	* 2' of Frost Present	()				Pocket Penetrometer Reading, TSF
					45	**Shelby Tube Pushed Hydraulically from 5.5' - 7.5' at 1000 PSI					

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. PBN-62-03ASurface Elevation 857.6Job No. C 10313Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		Moisture		N	Depth		q _s	W	LL	PL	D
No.	Type	↓	↓								
						Boring Completed from 30'-95' on 3/15/82 Unit: SAMS 2 Chief: Larry F. Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Coarse SAND and GRAVEL, Little Silt, Occasional Cobbles (SP-SM)					
					50						
9	SS	18"	M	180	55						
					60						
					65						
					70						
					75						
10	SS	18"	M	168	80	Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Coarse SAND, Some Gravel, Little Silt (SP-SM)					
					85						
					90						

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. PBN-82-03ASurface Elevation 857.6Job No. C.10313Sheet 3 of 3

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				q _s	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
						Very Dense, Pale Brown (10YR 6/3) Fine to Medium SAND, Little Silt (SP-SM)					
11	SS	12"	W	75	95						
						End Boring at 95'					
WATER LEVEL OBSERVATIONS						GENERAL NOTES					
While Drilling _____						Start <u>2/11/82</u> Complete <u>3/15/82</u>					
Upon Completion of Drilling _____						Crew Chief <u>JWG/MG</u> Rig <u>55-1</u>					
Time After Drilling <u>1/2 hour</u> _____						Drilling Method <u>CS 0-10'</u>					
Depth to Water _____						FA <u>10-30'</u>					
Depth to Cave In <u>23.0' Moist</u> _____						DM/WO <u>30-95'</u>					

ENGINEERING INC

Project Badger Army Ammunition Plant

Location Baraboo, Wisconsin

Boring No. PBN-82-036

Surface Elevation 857.6

Job No. C 10313

Sheet 1 of 1

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				q _u	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
						NOTE: For more detailed subsurface information, refer to Log of Test Boring No. PBN-82-3A					
						End Boring at 106'					
WATER LEVEL OBSERVATIONS						GENERAL NOTES					
While Drilling _____						Start <u>3/15/82</u> Complete <u>3/15/82</u>					
Upon Completion of Drilling _____						Crew Chief <u>LF</u> Rig <u>SAMS-1</u>					
Time After Drilling _____						Drilling Method <u>DM 0-106'</u>					
Depth to Water _____											
Depth to Cave In _____											



ENGINEERING INC

LOG OF TEST BORING

Project Badger Army Ammunition Plant.....

LocationBaraboo, Wisconsin.....

Boring No. PBN-82-03C

Surface Elevation 857.6.....

Job No. C 10313

Sheet 1 of 1

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		↓	Moisture		N		Depth	q _s	W	LL	PL	D
No.	Type		↓	↓								
						<p>NOTE: For more detailed subsurface information, refer to Log of Test Boring No. PBN-82-03A</p> <p>No Mud Loss During Drilling Operation</p>						
					120	End Boring at 118'						
WATER LEVEL OBSERVATIONS						GENERAL NOTES						
While Drilling _____						Start 2/13/82 Complete 2/13/82						
Upon Completion of Drilling _____						Crew Chief LF Rig SAMS-1						
Time After Drilling _____						Drilling Method DM 0-118'						
Depth to Water _____						_____						
Depth to Cave In _____						_____						

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
 Location Baraboo, Wisconsin

Boring No. PBN-82-04A
 Surface Elevation .873.0
 Job No. C-10313
 Sheet 1 of 3

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				G _s	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
1	SS	18"	M	46	46	Loose to Very Dense, Yellowish Brown (10YR 5/6) Fine to Medium SAND, Some Silt & Clay, Trace to Little Gravel, Occasional Cobbles (SM)					
2	SS	12"	M	8	54						
3	SS	18"	M	9	51						
4	SS	18"	M	14	46						
5	SS	17"	M	30	15	Some Gravel Encountered at 14'					
6	SS	18"	M	44	20						
7	SS	12"	M	60	25						
8	SS	5"	M	42	30	Dense, Pale Yellow (2.5Y 7/4) Fine to Coarse SAND, Little Silt, Little to Some Gravel, Occasional Cobbles (SP-SM) Boring Completed to 30' on 2/16/82 * 2.5' of Frost Present Note: Boring performed 20' north of proposed location due to presence of mud and snow.					

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. PBN-82-04ASurface Elevation 873.0Job No. C-10313Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		Moisture		N	Depth		q _u	W	LL	PL	D
No.	Type	↓	↓								
						Boring Completed from 30'-106' on 3/12/82 Unit: SAMS-2 Chief: Larry F. Very Dense, Pale Yellow (2.5Y 7/4) Fine to Medium SAND, Trace Silt, Little to Some Gravel (SP)					
					50						
9	SS	18"	M	240	55						
					60						
					65						
					70						
					75						
						Very Dense, Light Yellowish Brown (10YR 6/4) Fine to Coarse SAND and GRAVEL, Little Silt (SP-SM)					
10	SS	18"	M	280	80						
					85						
					90						

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. PBN-82-04ASurface Elevation 873.0Job No. C.10313Sheet 3 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				q _u	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
						Very Dense, Light Yellowish Brown (10YR 6/4) Fine to Medium SAND, Little Gravel, Little Silt (SP-SM)					
11	SS	18"	W	285		End Boring at 106'					
						NOTE: Recorded blow counts for Sample #9, #10 & #11 may be inaccurate. Hammer failed to fall freely for the specified 30" drop.					
WATER LEVEL OBSERVATIONS							GENERAL NOTES				
While Drilling _____							Start <u>2/16/82</u> Complete <u>3/12/82</u>				
Upon Completion of Drilling _____							Crew Chief <u>JWG/MG</u> Rig <u>55-1</u>				
Time After Drilling <u>1/2 hour</u>							Drilling Method <u>CS 0-10'</u>				
Depth to Water _____							FA 10-30'				
Depth to Cave In <u>25.0' Moist</u>							DM/WO 30-106'				



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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				q _s	W	LL	PL	O
No.	Type	↓	↓	N	Depth						
						<p>NOTE: For more detailed subsurface information, refer to Log of Test Boring No. PBN-82-04A</p> <p>Drilling from 90' - 118' performed on 3/13/82</p> <p>End Boring at 118'</p>					
WATER LEVEL OBSERVATIONS						GENERAL NOTES					
While Drilling _____						Start <u>3/12/82</u> Complete <u>3/13/82</u>					
Upon Completion of Drilling _____						Crew Chief <u>LF</u> Rig <u>SAMS-1</u>					
Time After Drilling _____						Drilling Method <u>DM 0-118'</u>					
Depth to Water _____											
Depth to Cave In _____											



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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				q _s	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
						NOTE: For more detailed subsurface information, refer to Log of Test Boring PBN-82-04A					
					40	End Boring at 129'					
					80						
					120						
WATER LEVEL OBSERVATIONS						GENERAL NOTES					
While Drilling _____						3/11/82 3/11/82					
Upon Completion of Drilling _____						Start Complete					
Time After Drilling						Crew Chief LF Rig SAMS-1					
Depth to Water						Drilling Method DM 0-129'					
Depth to Cave In											

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. PBN-82-05ASurface Elevation 875.8Job No. C 10313Sheet 1 of 3

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				P	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
1	SS	12"	M	7	*	Black (5Y 2.5/1) Clayey SILT (ML)	(4.5+)				
2	SS	18"	M	11	5		Medium to Very Stiff, Dark Brown (10YR 3/3) Silty CLAY (CL)	(3.5)			
3	SS	18"	M	7		(2.5)					
4	SS	18"	M	9	10	Little Sand at 10'	(0.8)				
5	SS	18"	M	2	15	Very Loose to Medium Dense, Dark Yellowish Brown (10YR 3/4) Fine SAND, Some Silt & Clay, Little Gravel (SM)					
6	SS	12"	M	18	20		Boring Completed to 20' on 2/15/82				
7	SS	14"	M	33	25	Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Medium SAND, Little Silt & Clay, Some Gravel (SP-SM)					
8	SS	14"	M	37	30		Boring Completed to 30' on 2/16/82				
					35	* 2.5' of Frost Present					
					40	Note: Moved over and pushed 3" ST hydraulically from 6' to 8' (100 PSI)	()	Pocket Penetrometer Reading, TSF			
					45	Sample 3A: 14" Recovery					

(Continued)

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LOG OF TEST BORING

Project Badger Army Ammunition Plant.....

Location Baraboo, Wisconsin

Boring No. PBN-82-05A

Surface Elevation 875.8

Job No. C 10313

Sheet 2 of 3

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
		Recovery		Moisture							
No.	Type	↓	↓	N	Depth		q _v	w	LL	PL	D
						Boring Completed from 30'-110' on 3/13/82					
					50	Unit: SAMS-2 Chief: Larry F.					
9	SS	14"	M	96	55	Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Medium SAND, Some Gravel, Little Silt & Clay (SP-SM)					
					60						
					65						
					70						
					75						
10	SS	12"	M	45	80	Dense, Light Yellowish Brown (10YR 6/4) Fine to Coarse SAND and GRAVEL, Little Silt, Occasional Cobbles (SP-SM)					
					85						
					90						

(Continued)

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. PBN-82-05ASurface Elevation 875.8Job No. C 10313Sheet 3 of 3

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SAMPLE

Recovery

Moisture

No. Type ↓ ↓ N Depth

**VISUAL CLASSIFICATION
and Remarks****SOIL PROPERTIES**q_s W LL PL D

Very Dense, Light Yellowish Brown
(10YR 6/4) Fine to Medium SAND,
Some Gravel, Little Silt
and Clay (SP-SM)

End Boring at 110'

WATER LEVEL OBSERVATIONS

While Drilling _____

Upon Completion of Drilling _____

Time After Drilling 1/2 hour _____

Depth to Water _____

Depth to Cave In 30.0' Moist _____**GENERAL NOTES**Start 2/15/82 Complete 3/13/82Crew Chief WJG/MG Rig 55-1Drilling Method CS 0-10'FA 10-30'DM/WO 30-110'

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. PBN-82-05BSurface Elevation 875.8Job No. C. 10313Sheet 1 of 1

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				No.	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
						NOTE: For more detailed subsurface information, refer to Log of Test Boring No. PBN-82-05A Drilling from 15' - 122' performed on 3/11/82 No Mud Loss During Drilling Operation					
						End Boring at 122'					
WATER LEVEL OBSERVATIONS						GENERAL NOTES					
While Drilling _____						Start <u>3/10/82</u> Complete <u>3/11/82</u>					
Upon Completion of Drilling _____						Crew Chief <u>LF</u> Rig <u>SAMS-1</u>					
Time After Drilling _____						Drilling Method <u>DM 0-122'</u>					
Depth to Water _____											
Depth to Cave In _____											



FIELD BORING LOG

BORING NO. LOB-90-01

TEST NO.: 6298-11	PROJECT NAME: USATHANA- BAAP FS	PAGE 1 OF 2
DRILLING CONTRACTOR: LAYNE SOUTHWEST	DRILLER: G Rodriguez	DATE STARTED 8/21 COMPLETED 8/21
METHOD: DUAL WALL	CASING SIZE: 9 IN	TIP NO: TE#2 PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 141.5'	WATER LEVEL: 140 TOTAL DEPTH: 141.5'
LOGGED BY: J Bliss	CHECKED BY: P. Bolan	DATE: 9/28/90

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
						TIP	LEL
S#1	0-1.5	147	18" 18"	dark brown med-fn SAND w/ silt gravel, black vitreous slag	fill	0.0	
S#2	5-6.5	524	18" 1"	black vitreous slag waste nail. (possible asphalt)	metals & AISC sample	0.0	
	6.5-7.5	442	18" 6"	black asphalt with wood sandy texture	fill	0.0	
S#3	10-12.5	101012	18" 6"	dark brown to black oily asphalt waste w/ wood.		3.9	
S#4	15-16.5	311816	18" 14"	15-15.5 dark brown to black asphalt was w/ coarse angular gravel.	change at 15.5	50	
				15.5-16.5 brown to tan fn-med sand w/ little gravel.	glacial fill ↓	00	
S#5	20-21.5	121113	18" 18"	tan fn-med SAND w/ little gravel + highly weathered gabbro boulder		00	
S#6	25-26.5	61011	18" 18"	Tan fn-med SAND w/ tree gravel		0.0	
S#7	46-47.5	71215	18" 18"	Tan med-fn SAND w/ tree gravel		0.0	

FIELD BORING LOG

BORING NO. 608-90-01

PROJECT NO.: 6298-11

PROJECT NAME: USATHAMA- SAAP FS

PAGE 2 OF 2

DRILLING CONTRACTOR: LAYNE SOUTHWEST

DRILLER: G. Rodriguez

DATE STARTED 8/21/90

COMPLETED

METHOD: DUAL WALL

CASING SIZE: 9 IN.

TIP W: TE#2

PROTECTION LEVEL: D

GROUND ELEV.:

SOIL DRILLED: 141.5'

WATER LEVEL: \approx 140

TOTAL DEPTH: 141.5'

LOGGED BY: J. B. Liss

CHECKED BY: P. Bohner

DATE: 9/28/90

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
						TIP	LEL
S#8	67-68.5	20 44	18" 14"	tan coarse-fine SAND with gravel	Fluvial deposit	0.0	
S#9	86-87.5	10 23 35	18" 18"	tan med-fn SAND w/ occasional gravel layer	6P/SP		
	87-116			- Med - fn SAND w/ gravel.			
	116-117			- possible silt zone (silt encrusted on cuttings)			
	117-119			- dense gravel/cobble zone.			
	122-124			- " " " "			
	128			- tan cuttings, less silt, cleaner.	6P/SP		
S#10	140-141.5	14 37 35	18" 12"	coarse gravel prevents results in loss of material from split spoon. 3rd attempt yields coarse sand & gravel.	6P		

FIELD BORING LOG				Boring No. LOM-91	
Project No 06853-03		Project Name BADGER AAP		Page 1 of 2	
Contractor LAYNE		Driller G RODRIGUEZ		Date started 10-10-91 completed 10-10-91	
Method DUAL WALL		Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level A	
Ground El		Soil Drilled 151'	± below ground 142	Total Depth 151'	
Logged by RRR		Checked by DRP		Date 10/11/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		
						HNU	LEL	
S-1	0-10'			LT BROWN SAND, PLG, F, TR COBBLES, TR C GRAVEL, TR SILT	(SP)	JAR	ATP	
S-2	10-20'			SAME AS S-1	(SP)	0	0	0
S-3	20'-30'			" " "	(SP)	0	0	0
S-4	30-40'			LT BROWN SAND, PLG, F, LITTLE F GRAVEL, TR C GRAVEL, TR COBBLES, TR SILT	(SP)	0	0	0
S-5	40-50			SAME AS S-4	(SP)	0	0	0
S-6	50-60			" " "	(SP)	0	0	0
S-7	60-70			LT BROWN SAND, WGD, M-C, SOME FINE GRAVEL, TR COBBLES, TR F SAND	(SW)	0	0	0
S-8	70-80			SAME AS S-7	(SW)	0	0	0
S-9	80-90			80-84': SAME AS S-7 84-90: LT BROWN SAND, TR FINE PLG, MED, LITTLE COARSE SAND, TR FINE SAND, TR FINE GRAVEL	(SW) (SP)	0	0	0
S-10	90-100			SAME AS S-9 (84-90')	(SP)	0	0	0
S-11	100-110			SAME AS S-10	(SP)	0	0	0
S-12	110-120			110-112: SAME S-10 112-120: COBBLE AND BOULDER ZONE, SOME C SAND, TR MEDIUM SAND	(SP)	0	0	0

FIELD BORING LOG				Boring No. 10m-91-	
Project NO06853-03		Project Name BADGER AAP		Page 1 of 2	
Contractor LANE		Driller G RODRIGUEZ		Date started 10-25-91 completed 10-25-91	
Method DUAL WALL		Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D	
Ground El		Soil Drilled 148'	± below ground/38'	Total Depth 148'	
Logged by TDR		Checked by DRP		Date 10/28/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-1	0-10'	0-8' 8-10'		BROWN CLAYEY SILT, TR F SAND. PCD LT BROWN SILTY SAND, PCD, F	(ML) (SP)	JAR	ATR
S-2	10-20'			LT BRWN SAND, PCD, F, LITTLE M, LITTLE SILT	(SP)		
S-3	20-30'			LT BROWN SAND, WGD, M, SOME F, LITTLE C, TR SILT, TR F GRAVEL, TR COBBLES	(SW)		
S-4	30-40			SAME AS S-3	(SW)		
S-5	40-50			LT BROWN SAND, PCD, M, LITTLE C, LITTLE F, TR F GRAVEL.	(SP)		
S-6	50-60			LT BROWN SAND, WGD, C, SOME F GRAVEL, SOME M SAND, LITTLE C GRAVEL, TR F SAND, TR COBBLES	(SW)		
S-7	60-70			SAME AS S-6	(SW)		
S-8	70-80			SAME AS S-6	(SW)		
S-9	80-90			" " "	(SW)		
S-10	90-100			LT BROWN SAND, WGD, M, SOME C, LITTLE F, LITTLE TO TR F GRAVEL, TR COBBLES TR SILT.	(SW)		
S-11	100-110	100-105 105-110		GREY-BROWN SANDY GRAVEL AND GRAVELY SAND, WGD C SAND, F GRAVEL. - COBBLE AND BOULDER ZONE	(SW) (GW)		
NO	110-120 SAMPLE			COBBLE + BOULDERS			
S-13	120-130	120-128 128-130		BROWN GRAVELLY SAND, WGD M-C, GRAVEL: F-C LT BROWN SAND, PCD, M, SOME C, LITTLE F	(SW)		

FIELD BORING LOG				Boring No. <u>3</u> Loc. <u>91</u>	
Project No. <u>06853-05</u>		Project Name <u>ISADLER AAP</u>		Page <u>2</u> of <u>2</u>	
Contractor <u>LAYNE</u>		Driller <u>G. Rodriguez</u>		Date started <u>10-25-91</u> completed <u>10-25-91</u>	
Method <u>DUAL WALL</u>		Casing Size <u>9" O.D.</u>	HNH <u>11.7/10.2</u>	Protection Level <u>D</u>	
Ground EL		Soil Drilled <u>148'</u>	<u>2</u> below ground <u>138.5'</u>	Total Depth <u>148'</u>	
Logged by <u>RRR</u>		Checked by <u>DRP</u>		Date <u>10/28/91</u>	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNH	LEL
S-14	130-140	130-133 135-140		SAME AS 128-130 BROWN SANDY GRAVEL, WGD, F.C, LITTLE COBBLES; SAND: C, SOME M, WET	(GW) 138.5'	JAR	ATR
S-15	140-148			BROWN GRAVEL, WGD, F.A., LITTLE F SAND, TR SILT B.O.E = 148'	(GW)		

FIELD BORING LOG

BORING NO. LOM-8901

PROJECT NO.: 5753-08

PROJECT NAME: USATHAMA-BAAP

PAGE 1 OF 1

DRILLING CONTRACTOR: LAYNE-NORTHWEST

DRILLER: G. RODRIGUEZ

DATE STARTED 2/16/89

COMPLETED 2/17/89

METHOD: DUAL WALL

CASING SIZE: 9"

TIP EV: 0.00

PROTECTION LEVEL: D

GROUND ELEV.: 915.9

SOIL DRILLED: 158.5'

WATER LEVEL: ~141'

TOTAL DEPTH: 158.5'

LOGGED BY: D. BELAN

CHECKED BY: JSP

DATE: 2/24/89

SAMPLE NO.	DEPTH IN FEET	BLOCS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEC.
S-1	0 - 10'			MED BRN, <u>SM</u> , MOIST, LOOSE			
S-2	10 - 20'			SH POORLY SORTED, WELL ROUNDED GRAVEL			
S-3	20 - 30'			MED BRN, <u>SM</u> , MOIST, LOOSE			
				OCCASIONAL FINE GRAVEL (SP)			
S-4	30 - 40'			MED BRN, <u>SM</u> , MOIST, LOOSE			
				TRACE FINE-MEDIUM GRAVEL (SP)			
S-5	40 - 50'			MED BRN, <u>SM</u> , MOIST, LOOSE			
				COBBLES AND GRAVEL (SP)			
S-6	50 - 60'			MED BRN, <u>SM</u> , MOIST, LOOSE, TR GRAVEL (SP)	✓ Change @ 60'		
S-7	60 - 70'			MED BRN, <u>SM</u> - GP, MOIST, LOOSE			
				ABUNDANT WELL ROUNDED, POORLY SORTED GRAVEL (GP)			
S-8	70 - 80'			MED BRN <u>SM</u> , MOIST, COARSE ABUNDANT	✓ Change @ 70'		
				WELL ROUNDED GRAVEL (SP)			
S-9	80 - 90'			MED BRN <u>SM</u> , MOIST, LOOSE, TRACE			
				TO MODERATE WELL ROUNDED GRAVEL (SP)			
S-10	90 - 100'			MED BRN <u>SM</u> , MOIST, LOOSE, TRACE			
				POORLY SORTED, WELL ROUNDED GRAVEL (SP)			
S-11	100 - 110'			SIMILAR TO S-10 (SP)			
S-12	110 - 120'			SIMILAR TO S-10 TO 112'			
				ROCK FRAGMENTS, PURPLE QUARTZ LIME		0.0	
				STONE, GRAVEL (SP)			
S-13	120 - 130'			GP POORLY SORTED POORLY SORTED,			
				ROUNDED, SOME ROCK FRAGMENTS		0.00	
				WITH LT BROWN SAND, FINE, FAIR			
				SORTING (SP)	✓ Change @ 130'		
S-14	130 - 140'			LT BRN, <u>SM</u> , DRY TO MOIST,			
				LOOSE, MODERATE GRAVEL (GM)			
				WELL ROUNDED, POOR SORTING (GP)			
S-15	140 - 150'			GM, WELL ROUNDED, POOR SORTING,	✓ @ 141'	0.00	
				TO ~141', THEN MED BRN <u>SM</u> , WET, MOD. COARSE			
S-16	150 - 160'			LT BRN <u>SM</u> , WET, MOIST, MODERATE	✓ Change @ 150'	0.0	
				GRAVEL (SP)			

EOP 2/17/89 DAB

FIELD BORING LOG

BORING NO. LOM-8902B

PROJECT NO.: 5753-	PROJECT NAME: USATHAMA- BAAP	PAGE 1 OF 1
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: G. RODRIGUEZ	DATE STARTED 2/17/89 COMPLETED 2/18/89
METHOD: DUAL WALL	CASING SIZE: 9"	TIP ØV: 00.0 PROTECTION LEVEL: D
GROUND ELEV.: 918.9	SOIL DRILLED: 200'	WATER LEVEL: 145.5 TOTAL DEPTH: 198-200'
LOGGED BY: D. BELAN	CHECKED BY:	DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
						TIP	LEL
S-1	0-10'			DK BRN, SM, MOIST, LOOSE TR GRAVEL		0.00	
S-2	10-20'			MED-DK BRN, SM, MOIST, LOOSE, MODERATE FINE GRAVEL, WELL ROUNDED	(SP)	0.00	
S-3	20-30'			MED BRN, SM, MOIST, LOOSE, TRACE GRAVEL (FINE), WELL ROUNDED	(SP)	00.0	
S-4	30-40'			MED BRN, SM-ML, MOIST, LOOSE, SOME COBBLES AND GRAVEL	(SP)	00.0	
S-5	40-50'			MED BRN, SM-ML, MOIST, LOOSE, SCATTERED COBBLES AND GRAVEL	(SP)	00.0	
S-6	50-60'			MED BRN, SM-ML, MOIST, LOOSE, COPIOUS COBBLES, SOME GRAVEL	(SP) ✓ CHANGE @ 60'	00.0	
S-7	60-70'			GM, WELL ROUNDED, POOR SORTING, WITH SOME MED BRN SM-ML	(GP) @ 60'	00.0	
S-8	70-80'			GM, WELL ROUNDED, POOR SORTING, W/SOME MED-LT BRN SM-ML	(GP)	00.0	
S-9	80-90'			SIMILAR TO S-8	(GP)	00.0	
S-10	90-100'			GM, WELL ROUNDED, FAIR SORTING WITH SOME LT BRN SM-ML	(SP) ✓ CHANGE @ 100'	00.0	
S-11	100-110'			GP-GM, WELL ROUNDED, AND LT BRN SAND, MOIST, LOOSE, VERY FINE FINE GRAINED	(SP)	00.0	
S-12	110-120'			GW, ANG - MODERATELY ROUNDED, LITTLE LT BRN SAND, MOIST, LOOSE, VERY FINE - FINE GRAINED, COBBLES	(SP)	00.0	
S-13	120-130'			GW, ANG - ROUNDED, TRACE-LITTLE LT BRN SAND, COBBLES	(GP) ✓ CHANGE @ 120'	00.0	
S-14	130-140'			GW, TO APPROX 134'; THEN MOSTLY VERY LT BRN SP, COBBLES	(GP)	00.0	
S-15	140-150'			GW, ANG - ROUNDED, ANG SP, VERY LT BRN,	(GP) ✓ CHANGE @ 150'	00.0	
S-16	150-160'			SP, LT BRN, VERY FINE GRAINED, WET, LOOSE, WITH SOME POORLY SORTED GRAVEL	(GP)	00.0	
S-17	160-170'			SP, SIMILAR TO S-16	(GP)	00.0	
S-18	170-180'			SIMILAR TO S-16	(GP)	00.0	
S-19	180-190'			SP, WITH SOME GRAVEL	(GP) ✓ CHANGE @ 190'	00.0	
S-20	190-200'			GW, COBBLES	(GP)	00.0	

EOB 2/18/89 1455 HRS

FIELD BORING LOG

BORING NO. LON 8903B

PROJECT NO.: 5753-08 PROJECT NAME: USATHAMA-BAAP PAGE 1 OF 1
 DRILLING CONTRACTOR: LAYNE-NORTHWEST DRILLER: G. RODRIGUEZ DATE STARTED 2/20/89 COMPLETED 2/24/89
 METHOD: Dual Wall CASING SIZE: 9" TIP GV: 00.0 PROTECTION LEVEL: D
 GROUND ELEV.: SOIL DRILLED: 200' WATER LEVEL: 144.5' TOTAL DEPTH: 200'
 LOGGED BY: D.H. BELAN CHECKED BY: gdp DATE: 2/24/89

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-1	0-10'			DK BRN. SP-SW, MOIST, LOOSE TRACE GRAVEL, WELL ROUNDED, PRESORTING.	(GM)	00.0	
S-2	10'-20'			SIMILAR TO S-1	✓ change @ 10'	0.00	
S-3	20'-30'			DK-MED BRN SP, SOME SW, MOST LOOSE, TR GW - GP.	(SP)	00.0	
S-4	30-40'			SIMILAR TO S-3	(SP)	00.0	
S-5	40-50'			MED BRN SP, MOIST, LOOSE; SOME GW, WELL ROUNDED	(SP)	00.0	
S-6	50-60'			MED BRN SP, MOIST - LOOSE, SOME GW, WELL ROUNDED	(SP)	00.0	
S-7	60-70'			SIMILAR TO S-6	(SP)	00.0	
S-8	70-80'			MED BRN SP, MOIST, LOOSE, SOME GW, WELL ROUNDED	(SP)	00.0	
S-9	80-90'			MED BRN SP, DAMP, LOOSE, V-FINE-FINE GRAINED, SUB ANG, WITH SOME SW, WELL ROUNDED	(SP)	00.0	
S-10	90-100'			MED BRN SP, DAMP, LOOSE, VFG - FG, SUB ANG, W/LITTLE-TRACE GW, WELL RND	(SP)	00.0	
S-11	100-110'			MED BRN SP, DAMP, LOOSE, VFG - FG, SUB ANG, W/TRACE GW, WELL RND	(SP)	00.0	
S-12	110-120'			SIMILAR TO S-11	(SP)	00.0	
S-13	120-130'			SIMILAR TO S-11	✓ change @ 120'	00.0	
S-13	120-130'			GW, SUB RND - SUB ANG, W/TRACE SP MED BRN	(GP)	00.0	
S-14	130-140'			GW, SUB RND - SUB ANG, W/LITTLE SP, MED BRN, VFG - FG	(GP)	00.0	
S-15	140-150'			GW, SUB RND - SUB ANG, TO ~ 145'; THEN SP, WET, LOOSE, VFG - FG W LITTLE GP, BLACK, ANG.	(GP)	00.0	
S-16	150-160'			SP, WET, LOOSE, VFG - FG, WITH LITTLE GW, ROUNDED - ANG	✓ change @ 150'	00.0	
S-17	160-170'			SIMILAR TO S-16	(GP)	00.0	
S-18	170-180'			SP, WET, LOOSE, VFG - FG, W/TRACE GW - GP, ROUNDED - ANG	(GP)	00.0	
S-19	180-190'			SP, WET, LOOSE, BROWN, VFG - FG SLIGHT TRACE GP	(GP)	0.00	
S-20	190-200'			SAME AS ABOVE.	(GP)	00.0	

DHB

EOB 1300 HRS @ 200'
 2/20/89

FIELD BORING LOG				Boring No. SPB-91-01	
Project No 6853-03		Project Name BAAP		Page <u>1</u> of <u>2</u>	
Contractor MATHE'S		Driller K. Bunschneyer		Date started 10-14-91 completed 10-14-91	
Method HSA/KHIE 75		Casing Size 4.25"	HNU 11.7 (10.2)	Protection Level D	
Ground El.		Soil Drilled 65'	± below ground 62.5'	Total Depth 65'	
Logged by RHA		Checked by DRP		Date 10/14/91	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		SP
							HNU	LEL	
13:56 59101002	S-1	0-2'	2 6/6/9	2.0 1.4	Dk. Brown clayey Silt; trace organics and coarse sand; dry, Top Soil (ML)	Analytical	JAR	BJR	SP
14:01 59101007	S-2	5-7'	4 5/6/6	2.7 7.2	Dk. Brown fine to med. Sand; some silt; trace organics and coarse sand; dry, Top Soil (SM)	Analytical	BJ	BJL	SP
14:11 59101012	S-3	10-12'	5 7/6/7	2.9 1.7	Brown fine sand; little medium sand in seams (2" max) is stained dk brown; no thin sandings or stained soil or color; dry (SP)	Analytical	BJ	BJL	SP
14:18	S-4	15-17	2 4/5/7	2.0 2.0	Fin medium Sand; trace fine and coarse sand; damp (SP)	Reference		BJL	SP
14:26 59101022	S-5	20-22	3 3/4/5	2.0 1.5	Brown medium Sand; some coarse sand; trace fine sand and medium gravel and dark brown silt. It appears the sample is stained (dark brown) in places... could be organics from plow horizon/manure. (SP)	Analytical	BJ	BJL	SP

FIELD BORING LOG				Boring No. SPB-41	
Project No. 68-53-03		Project Name BAAP		Page 2 of 2	
Contractor MATHEWS		Driller K. Bunselmeier		Date started 10-14-91 completed 10-14-91	
Method WSA/CME 75		Casing Size 4.25"		HNU 11.71(10.2)	
Ground El.		Soil Drilled 65'		2' below ground 62.5'	
Total Depth 65'		Logged by RHA		Checked by DRP	
Date 10/14/91					

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		SP
							HNU	LEL	
14:35	S-6	30-32	1/3/4/4	2/1.3	Brown medium Sand; little coarse sand; trace fine sand and silt in seams; damp. (SW)	Reference	JAR	ATK	13/5
14:50	S-7	40-42	8/11/11/20	2.0/1.6	Tan to brown medium sand; little coarse sand; trace fine to medium rounded gravel and silt. sample peppered w/HM. damp. (SW)	Reference	OK	OK	13/5
15:00	S-8	50-52	6/7/8/12	2.0/2.0	Tan fine ^{med} medium sand; little fine sand; trace HM; dry (SP)	Reference	OK	OK	13/5
15:15 59101062	S-9	60-62	13/10/28/13	2.0/2.0	Tan fine Sand; wet (SP)	Reference Analytical	OK	OK	13/5
15:30 59101067	S-10	65-67	4/10/15/26	2.0/1.6	Tan fine Sand; wet (SP)	Analytical 7' 62.5' T.D. 65'	OK	OK	13/5

FIELD BORING LOG				Boring No. ^{SPN-91-} 021	
Project No. 06853-03		Project Name BADGER AAP		Page 1 of 2	
Contractor LAYNE		Driller G. ROBRIVUEZ		Date started 10-9-91 completed 10-9-91	
Method DUAL WALL		Casing Size 9"	HNU 11.7/10.2	Protection Level 1	
Ground El		Soil Drilled 190'	2' below ground 65'	Total Depth 190'	
Logged by TERC		Checked by		Date	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-1	0-10'			LT BROWN SAND, WGD, F-M, SOME GRAVEL, LITTLE COBBLES.	(SW)		
	10-23'			GLACIAL ERRATIC BOULDER			
S-2	23'-30'			LT BROWN SANDY GRAVEL WGD, F-C GRAVEL, C. SAND, SOME COBBLES 2"-4" DIAM.	(GW-GP)		
S-3	30-40'			LT BROWN SAND, WGD, COARSE, SOME MEDIUM SAND, SOME FINE GRAVEL TR. COBBLES.	(SW)		
S-4	40-50'			SAME AS S-3 BUT W/ COARSE GRAVEL BED 45-46'			
S-5	50-60'			50-55': SIMILAR TO S-3 55'-60': LT BROWN SAND PGD, F-M, LITTLE C SAND TR. SILT, TR GRAVEL	(SP)		
S-6	60-70'			LT BROWN SAND, PGD, F-M, LITTLE C SAND, TR SILT, TR GRAVEL	(SP)		
S-7	70'-80'			LT BROWN SAND, PGD, F, LITTLE MEDIUM, TR SILT.	(SP)		
S-8	80-90'			SIMILAR TO S-7	(SP)		

WATER TABLE
AT 2 65'

FIELD BORING LOG				Boring No. ^{SPN-91}	
Project No		Project Name		Page <u>2</u> of <u>2</u>	
Contractor		Driller		Date started completed	
Method		Casing Size		HNU 11.7/10.2 Protection Level	
Ground El		Soil Drilled		2 below ground Total Depth	
Logged by		Checked by		Date	

ABD

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		
						HNU	LEL	
S-9	90-100			COARSE BROWN SAND SOME F. GRAVEL, P.G.D. (SP)		0	0	0
S-10	100-110			LT BROWN SAND P.G.D. C, SOME F. GRAVEL (SP) TR. FINE SAND WET		0	0	0
S-11	110-120			LT BROWN SAND P.G.D. C, TR. F GRAVEL (SP)	SAMPLE SEEMS TO FINE DOWN			
S-12	120-130			SAME AS S-11 (SP)	CONSIDERABLE HEAVING	0	0	
S-13	130-140			BROWN SAND, P.G.D., (SP) M-C, QUARTZITE COBBLE		0	0	0
S-14	140-150			SAME AS S-13 (SP) COARSENING DOWNWARD TO SOME FINE GRAVEL		0	0	0
S-15	150-160			SANDY BROWN GRAVEL, W.G.D. FINE, SOME COARSE SAND, SOME MED. SAND TR COBBLES ATBITE		0	0	0
S-16	160-170			SAME AS S-15		0	0	0
S-17	170-180			BR GRAVELY SAND, W.G.D. M-C, TR COBBLES		0	0	0

FIELD BORING LOG				Boring No.	
Project No		Project Name		Page ____ of ____	
Contractor		Driller		Date started completed	
Method		Casing Size		HNU 11.7/10.2 Protection Level	
Ground EL		Soil Drilled		2 below ground Total Depth	
Logged by		Checked by		Date	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		
						HNU	LEL	
S-12	120-130			BROWN COARSE SAND (SP) P GRADED, WET TR. F. GRAVEL	FROM 120-130 NO CUTTINGS COMING UP INDICATE CONSIDERABLE HEAVING.	JAR	AIR	
S-13	130-140			MED - COARSE BROWN SAND, QUARTZITE CURBLE, P. GRADED (SP)				
S-14	140-150			SAME AS S-13 (SP) CONSISTING DOWNWARD TO SOME FINE GRAVEL	SAND HEAVING - FASTER THAN WATER BOWL PUMPS. STOPPED TO GET NEW PUMP.			
S-15	150-160			BROWN COARSE SAND + FINE GRAVEL, SOME COARSE GRAVEL, LITTLE COBBLES QUARTZITE, WELL GRADED WET. TR. MED SAND				
S-16	160-170			SAME AS S-15				
S-17	170-180			MED - COARSE BR, SAND P GRADED WET.				
S-18	180-190			COARSE SAND AND GRAVEL (FINE - MED) WELL GRADED. TR. MED SAND				

FIELD BORING LOG				Boring No. ^{SPN-91-} 021	
Project No. 06853-03		Project Name BADGER AAP		Page 1 of 2	
Contractor LAYNE		Driller G. RODRIGUEZ		Date started 10-9-91 completed 10-9-91	
Method DUAL WALL		Casing Size 9" O.D.		HNU 11.7/10.2 Protection Level 1	
Ground El.		Soil Drilled 190'		2' below ground 65' Total Depth 190'	
Logged by TCR		Checked by DRP		Date 10/11/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-1	0-10'			LT BROWN SAND, WGD, F-M, SOME GRAVEL, LITTLE COBBLES.	(SW)	0	0
	10-23'			GLACIAL ERATIC BOULDER			
S-2	23'-30'			LT BROWN SANDY GRAVEL, WGD, F-C GRAVEL, C. SAND, SOME COBBLES 2"-4" DIAM.	(SW)	0	0
S-3	30-40'			LT BROWN SAND, WGD, COARSE, SOME MEDIUM SAND, SOME FINE GRAVEL TR. COBBLES.	(SW)	0	0
S-4	40-50'			SAME AS S-3 BUT W/ COARSE GRAVEL BED 45-46'	(SW)	0	0
S-5	50-60'			50-55': SIMILAR TO S-3 55'-60': LT BROWN SAND PGD, F-M, LITTLE C SAND TR. SILT, TR GRAVEL	(SW)	0	0
S-6	60-70'			LT BROWN SAND, PGD, F-M, LITTLE C SAND, TR SILT, TR GRAVEL	(SP) WATER TABLE AT \approx 65'	0	0
S-7	70'-80'			LT BROWN SAND, PGD, F, LITTLE MEDIUM, TR SILT.	(SP)	0	0
S-8	80-90'			SIMILAR TO S-7	(SP)		

FIELD BORING LOG				Boring No. SPB-41-01	
Project No. 6853-03		Project Name BAAP		Page 2 of 2	
Contractor MATHEIS		Driller K. Binselmeyer		Date started 10-14-91 completed 10-14-91	
Method HSA/CME 75		Casing Size 4.25"	HNU 11.71(103)	Protection Level D	
Ground El	Soil Drilled 65'	± below ground 62.5	Total Depth 65'		
Logged by RHA		Checked by DRP	Date 10/14/91		

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		SP
							HNU	LEL	
14:35	S-6	30-32	1/3/4/4	2/ 1.3	Brown medium Sand; little coarse sand; trace fine sand and silt in seams; damp. (SW)	Reference	JAR 34	ATM 13/5	D
14:50	S-7	40-42	8/11/11/20	2.0/ 1.6	Tan to brown medium sand; little coarse sand; trace fine to medium rounded gravel and silt. sample peppered w/STM. damp. (SW)	Reference	OK	OK	OK
15:00	S-8	50-52	6/7/8/12	2.0/ 2.0	Tan fine ^{med} medium sand; little fine sand; trace HM; dry (SP)	Reference	OK	OK	OK
15:15 59101062	S-9	60-62	13/11/28/33	2.0/ 2.0	Tan fine Sand; wet (SP)	Reference Analytical	OK	OK	OK
15:30 59101067	S-10	65-67	4/10/15/20	2.0/ 1.6	Tan fine Sand; wet (SP)	Analytical 7 62.5 T.D. 65'	OK	OK	OK

FIELD BORING LOG				Boring No. 573	
Project No 6853-03		Project Name B.4AP		Page 1 of 2	
Contractor MATHES		Driller K. Bunschneyer		Date started 10-14-91 completed 10-14-91	
Method USA/ENR 75		Casing Size 4.25"		HNU 11.7(103)	
Ground El		Soil Drilled 65'		Protection Level D	
		2' below ground 2.5		Total Depth 65'	
Logged by RHA		Checked by DRP		Date 10/14/91	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		SP
							HNU	LEL	
13:56 591010012	S-1	0-2'	2/6/6/9	2.0/ 1.4	Dark Brown clayey Silt; trace organics and coarse sand; dry, Top Soil (ML)	Analytical	JAR/ATR	B ₂ B ₂ K ₂	B ₂
14:01 591010007	S-2	5-7'	4/5/6/6	2.9/ 2.0	Dark Brown fine to med. Sand; some silt; trace organics and coarse sand; dry, Top Soil (SM)	Analytical		B ₂ B ₂ K ₂	B ₂
14:11 591010012	S-3	10-12'	5/7/6/7	2.0/ 1.7	Brown fine sand; little medium sand in seams (2" wide) is stained dark brown; no thin sandings or stained soil or odor; dry (SP)	Analytical		B ₂	B ₂
14:18	S-4	15-17	2/4/5/7	2.0/ 2.0	Fin medium Sand; trace fine and coarse sand; damp (SP)	Reference		B ₂	B ₂
14:26 591010022	S-5	20-22	3/3/4/5	2.0/ 1.5	Brown medium Sand; some coarse sand; trace fine sand and medium gravel and dark brown silt. It appears the sample is stained (dark brown) in portions. -- could be organics from plow horizon/manure. (SP)	Analytical		B ₂ B ₂ K ₂	B ₂

FIELD BORING LOG				Boring No. ^{SPN-91} - 021	
Project No. 06853-03		Project Name BANGER AAP		Page 2 of 2	
Contractor LAYNE		Driller G. R. DOWD		Date started 10-9-91 completed 10-9-91	
Method <u>DUAL WALL</u>		Casing Size 9" O.D.	HNU 11.71102	Protection Level <u>D</u>	
Ground El.		Soil Drilled 190'	± below ground 65'	Total Depth 190'	
Logged by <u>DRK</u>		Checked by <u>DRP</u>		Date 10/11/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		
						HNU	LEL	
S-9	90-100'			BROWN SAND, MOD. G.D. M.C., SOME FINE GRAVEL TR. FINE SAND	(SW)	0	0	0
S-10	100-110			SIMILAR TO S-9	(SW)	0	0	0
S-11	110-120			" " "		0	0	0
S-12	120-130			BROWN SAND, PGD, MED., SOME C SAND, LITTLE F SAND, TR GRAVEL, TR SILT.	(SP)	0	0	0
S-13	130-140			SAME AS S-12	(SP)	0	0	0
S-14	140-150			SAME AS S-12	(SP)	0	0	0
S-15	150-160			" " "	(SP)	0	0	0
S-16	160-170			BROWN SAND, PGD, M.C. LITTLE F GRAVEL, TR. F. SAND, TR. SILT.	(SP)	0	0	0
S-17	170-180			BROWN SAND, WGD, C, SOME MED. SAND, SOME GRAVEL, TR FINE SAND	(SW)	0	0	0
S-18	180-190			SAME AS S-17	(SW)	0	0	0
				B.O.B. = 190'				

FIELD BORING LOG				Boring No. SPN-91-020	
Project No. 06853-03		Project Name BADGER 4AP.		Page 1 of 3	
Contractor LAYNE		Driller G. RODRIGUEZ		Date started 9-25-91 completed 9-28-91	
Method DUAL WALL		Casing Size 9" O.D.		HNH 11.7/10.2	
Ground El.		Soil Drilled 192'		7' below ground G3	
Total Depth 192'					
Logged by RRR		Checked by DRP		Date 10/10/91	

ABANDONED

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	HNH jar	Comments on Advance of Boring	Monitoring	
							HNH	LEL
S-1	0-10'			LT BROWN, P.Gb, F.M. SAND DAMP (SP)	0		0	0
S-2	0-20'			LT BROWN, P.Gb M-C SAND (SP) DAMP	0		0	0
S-3	20-30'			SAME AS S-2 (SP)	0		0	0
S-4	30-40'			BROWN, MOD. GB (SW) M-C SAND. Some F. GRAVEL. DAMP	0		0	0
	40-50'			NO SAMPLE				
S-5	50-60'			LT BROWN, MOD. GB (SW) M-C SAND, Some F. GRAVEL, TR. SOLVENT COBBLES	0		0	0
S-6	60-70'			BROWN SAND (SP) P.Gb, F.M. WET	0	HIT WATER TABLE AT 63' 9-25-91 9-26-91	0	0
S-7	70-80'			LT BROWN SAND (SP) P.Gb, F.M., TR. COARSE, TR. SILT WET	0		0	0
S-8	80-90'			SAME AS S-7 (SP)	0		0	0

FIELD BORING LOG				Boring No. ^{SPN-91-02b}	
Project No. <u>06853-03</u>		Project Name <u>BADGER AAP</u>		Page <u>2</u> of <u>3</u>	
Contractor <u>LAYNE</u>		Driller <u>G. RODRIGUEZ</u>		Date started <u>9-25-91</u> completed <u>9-28-91</u>	
Method <u>DUAL WALL</u>		Casing Size <u>9" O.D.</u>	HNU <u>11.7110.2</u>	Protection Level <u>D</u>	
Ground El.		Soil Drilled <u>192'</u>	<u>2'</u> below ground <u>63'</u>	Total Depth <u>192'</u>	
Logged by <u>RTR</u>		Checked by <u>DRP</u>	Date <u>10/10/91</u>		

ABD

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		
						HNU	LEL	
S-9	90-100			COARSE BROWN SAND SOME F. GRAVEL P.G.D. (SP)		0	0	0
S-10	100-110			LT BROWN SAND P.G.D. C, SOME F. GRAVEL (SP) TR. FINE SAND WET		0	0	0
S-11	110-120			LT BROWN SAND P.G.D. C, TR. F GRAVEL (SP)	SAMPLE SEEMS TO GIVE DOWN			
S-12	120-130			SAME AS S-11 (SP)	CONSIDERABLE HEAVING	0	0	0
S-13	130-140			BROWN SAND, P.G.D. (SP) M-C, QUARTZITE COBBLE		0	0	0
S-14	140-150			SAME AS S-13 (SP) COARSENING DOWNWARD TO SOME FINE GRAVEL		0	0	0
S-15	150-160			SANDY BROWN GRAVEL, W.G.D. (W) FINE, SOME COARSE SAND, SOME MED. SAND TR COBBLES AT BITE		0	0	0
S-16	160-170			SAME AS S-15 (W)		0	0	0
S-17	170-180			BR GRAVELY SAND, W.G.D. (SW) M-C, TR COBBLES		0	0	0

FIELD BORING LOG				Boring No. <u>SPN-91-25</u>	
Project No <u>06853-03</u>		Project Name <u>ISADLER AAP</u>		Page <u>3</u> of <u>3</u>	
Contractor <u>LAYNE</u>		Driller <u>L. RODRIGUEZ</u>		Date started <u>9-25-91</u> completed <u>9-28-91</u>	
Method <u>DUAL WAVE</u>		Casing Size <u>9" O.D.</u>		HNU <u>11.71102</u>	
Ground El		Soil Drilled <u>192'</u>		Protection Level <u>D</u>	
		& below ground <u>63'</u>		Total Depth <u>192'</u>	
Logged by <u>RIRIC</u>		Checked by <u>DRP</u>		Date <u>10/10/91</u>	

ABD

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-18	180-190			<u>BROWN GRAVELLY SAND</u> (SW) <u>GRADING TO SANDY GRAVEL</u> (SW) <u>F-M GRAVEL C SAND</u> <u>WGD</u> <u>B.O.E. 192'</u> <u>WELL ABANDONED ON 9-28-91</u> <u>DUE TO INABILITY TO PREVENT HEAVING SANDS</u>			0

FIELD BORING LOG				Boring No. ^{SPN-91} 031	
Project No. 06853-03		Project Name BADGER AAP		Page 1 of 3	
Contractor LAYNE		Driller G. BORRER		Date started 10-8-91 completed 10-8-91	
Method DUAL WALL	Casing Size 9"	HNU 11.7110.2	Protection Level D		
Ground El	Soil Drilled 200'	± below ground 60'	Total Depth 200'		
Logged by RRR		Checked by		Date	

Sample No	Depth in Feet	Blows per 6 inches	Pen rec	Description	Comments on Advance of Boring	Monitoring		
						HNU	LEL	
S-1	0-10'			LT BROWN SAND F-M, PGD, TR COBBLES (FRACTURED)	(SP)	7.4	0	0
S-2	10-20'			LT BROWN SAND PGD, M-C TR F. GRAVEL, TR F. SAND	(SP)	2920	0	0
S-3	20-30'			LT BROWN SAND PGD, M-C, LITTLE COBBLES 2"-4", TR F. SAND, TR F. GRAVEL	(SP)	0	0	0
S-4	30-40'			LT BROWN SAND MOD. GRD, M-C, TR COBBLES 2"-4" LITTLE FINE GRAVEL TR. F. SAND.	(SP-SW)	0	0	0
S-5	40-50'			SIMILAR TO S-4	(SP-SW)	0	0	0
S-6	50-60'			BROWN SAND, PGD, M-C, TR FINE GRAVEL TR F. SAND	HIT WATER TABLE AT 60' (SP) TRIPPED OUT TO CHANGE BITS ON CASING	1.1	0	0
S-7	60-70'			BROWN SAND, PGD F-M, TR SILT	(SP)	0	5.3	0
S-8	70-80'			SIMILAR TO S-7	(SP)	0	0	0

FIELD BORING LOG				Boring No. ^{SPN-91-} 0315	
Project No 0685J-01		Project Name <u>BANDER AAP</u>		Page <u>2</u> of <u>3</u>	
Contractor <u>LAYNE</u>		Driller <u>G. RODRIGUEZ</u>		Date started <u>10-8-91</u> completed <u>10-8-91</u>	
Method <u>DUAL WALL</u>		Casing Size <u>9"</u>	HNU <u>11.7/102</u>	Protection Level <u>D</u>	
Ground El		Soil Drilled <u>200'</u>	<u>±</u> below ground <u>60'</u>	Total Depth <u>200'</u>	
Logged by <u>RRR</u>		Checked by		Date	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-9	80-90'			80-87' - SIMILAR TO S-7 87'-90' <u>BROWN SAND</u> WGD, M-C, SOME COARSE GRAVEL, LITTLE COBBLES, TR SILT	(SW)	JAR 0 0	ATR 0
S-10	90-100'			<u>BROWN GRAVELLY SAND</u> WGD, MED, SOME COARSE, LITTLE FINE SAND, TR SILT, GRAVEL: FINE-MED	(SW)	0 0	0
S-11	100-110'			<u>BROWN SAND</u> MOD. GRD, M-C, SOME F.M GRAVEL, TR COBBLES, TR F. SAND, TR SILT	TOOK FOR SAMPLES AT 100' (SW-6W)	0 0	0
S-12	110-120'			<u>BROWN SAND</u> , PLD, MED, SOME COARSE, TR FINE GRAVEL, LITTLE F. SAND.	(SP)	0 0	0
S-13	120-130'			SAME AS S-12	(SP)	0 0	01
S-14	130-140'			SAME AS S-12	(SP)	0 0	0
S-15	140-150'			SAME AS S-12	(SP)	0 0	0
S-16	150-160'			SAME AS S-12 & 150-155' 155-160' & <u>BROWN SAND</u> MED, PLD, SOME COARSE, LITTLE F. SAND, TR F.M GRAVEL, TR COBBLES.	(SP)	0 12.7	0

FIELD BORING LOG				Boring No. SPN-91 03D	
Project No 06853		Project Name BAGESZ AAP		Page 3 of 3	
Contractor LAYNE		Driller G. RODRIGUEZ		Date started 10-8-91 completed 10-8-91	
Method <u>WALWALL</u>		Casing Size 9"		HNU 11.7/10.2	
Ground El		Soil Drilled 200'		Protection Level <u>2</u>	
		2' below ground 60'		Total Depth 200'	
Logged by RER		Checked by		Date	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		
						HNU	LEL	
S-17	160-170			BROWN SAND, PGD, MED. SOME COARSE, LITTLE FINE. TR SILT. TR COBBLES.	(SP)	JAR	ATR	0
S-18	170-180			SAME AS S-17	(SP)	0	0	0
S-19	180-190			180-185': SAME AS S-17 185-190: BROWN GRAVELY SAND, WGD, MED, SOME COARSE SAND. GRAVEL: F-M TR SILT, LITTLE F. SAND	(SW)	0	0	0
S-20	190-200			BROWN SAND AND GRAVELY SAND ALTERNATING BEDS. M-C, WGD, GRAVEL: F-C, LITTLE F-SAND, TR SILT.	(SW)	0	0	0
				BOB = 202' AT 12:30				

FIELD BORING LOG				Boring No. <u>SP-1</u>	
Project No <u>06853-03</u>		Project Name <u>BADGER AAP</u>		Page <u>1</u> of <u>3</u>	
Contractor <u>LAYNE</u>		Driller <u>L. ZOSAWA</u>		Date started <u>9-28-91</u> , completed <u>10-2-91</u>	
Method <u>DUALWALL</u>		Casing Size <u>9" O.D.</u>	MMU <u>11.7/10.2</u>	Protection Level <u>D</u>	
Ground El <u></u>		Soil Drilled <u>212'</u>	<u>2'</u> below ground <u>48'</u>	Total Depth <u>212'</u>	
Logged by <u>RRR</u>		Checked by <u>DRP</u>		Date <u>10/10/91</u>	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LELY
S-1	0-10			ORGANIC MATTER, DARK TO LIGHT BROWN SANDS w/ P.G.S., FINE-MED. SOME SILT, DRY LITTLE F-M GRAVEL	(SP) TECHNICAL PROBLEMS WITH P.I.D. METER	0	01
S-2	10-20			LT BROWN GRAVELY SANDS w/ G.S., F-M & SOME COARSE SAND. LAYERS OF COARSE GRAVEL, DRY VERY LOOSE	(SW)	0	00
S-3	20-30			LT BROWN SANDS, MOD. G.S. M-C, LITTLE FGR. M COARSE GR	(SW)	0	
S-4	30-40			LT BROWN SAND GRAVELY SANDS w/ G.S. M-C SOME MEDIUM COARSE TRACE COARSE GRAVEL TRACE & 3" QUARTZITE COBBLES, DAMP	(SW)	0	0
S-5	40-50			SAME AS S-4	(SW) HIT WATER TABLE AT 48'	0	0
S-6	50-60			LT BROWN SANDS P.G.S., FINE-MED TRACE FINE GRAVEL, WET	(SP)	0	0
S-7	60-70			SIMILAR TO S-6	(SP)	0	

FIELD BORING LOG				Boring No. SPN-91-040	
Project No. 0653-03		Project Name BADGER AAP		Page 2 of 3	
Contractor LAYNE		Driller G. RODRIGUEZ		Date started 9-28-91 completed 10-6-91	
Method DUALWALL		Casing Size 9" O.D.	MNU 11.7110.2	Protection Level	
Ground El.		Soil Drilled 212	± below ground 48'	Total Depth 212	
Logged by RER		Checked by DRP		Date 10/10/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		
						MNU	LEL	
S-8	70-80			70-75' LT BROWN SAND (SP) NOTE H AT 75' WATER P.G.D., F-M TR SILT		0	0	0
				75-80' BROWN SANDY (SW) TURNED DARK BROWN. GRAVEL, SAND M-C, WGD SOME COARSE GRAVEL LITTLE COBBLES 8" IN DIA. TR SILT		0	0	0
S-9	80'-90'			BROWN GRAVELLY SAND (SW) WGD, M-C, LITTLE COARSE GRAVEL, TR. SILT, TR FINE SAND.		0	0	0
S-10	90-100			BROWN SAND P.G.D., MED (SP) SOME COARSE, TR. FINE		0	0	0
S-11	100-110			SAME AS S-10 WITH (SP) LITTLE FINE GRAVEL		0	0	0
S-12	110-120			SAME AS S-11 (SP)		0	0	0
S-13	120-130			BROWN SAND M-C P.G.D., TR FINE GRAVEL (SP) TR FINE SAND, TR SILT		0	0	0
S-14	130-140			SAME AS S-13 (SP)		0	0	0
S-15	140-150			BROWN SAND, MOD. GR (SW) M-C, SOME GRAVEL, TR. SILT		0	0	0
S-16	150-160			BROWN GRAVELLY SAND (SW) WGD, M-C, TR. SILT TR. COBBLES 2" - 4" DIA. M.		0	0	0
NO SAMPLE	160-170			NO SAMPLE				
S-17	170-180			ALTERNATING BEDS OF (SW) GRAVELLY SAND, SANDY GRAVEL, AND SAND, M-C (SW) WGD., TR. SILT		0	0	0

FIELD BORING LOG				Boring No. SPN-91-04N	
Project No. 06833-01		Project Name BADGER		Page 3 of 3	
Contractor LAYNE		Driller G. Rodriguez		Date started 9-28-91 completed 10-2-91	
Method Dual Wall		Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D	
Ground El.		Soil Drilled 212'	± below ground 48'	Total Depth 212'	
Logged by RRR		Checked by DRP	Date 10/10/91		

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-18	180-190			BROWN SAND, PGD (SP) M-C, TR FINE GRAVEL TR SILT	WATER BROWN DUE TO SILT	0	0
S-19	190-200			SAME AS 180-190 (SP)		0	0
S-20	200-209			BROWN SAND MED-C. PGD. SOME FINE INTERBEDS OF COARSE WGD GRAVELS & 1" DIAM.	(SP) (GW) BOE 212'	0	0
				BEDROCK			

FIELD BORING LOG

BORING NO. SPN-89-01C

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP	PAGE 1 OF 1
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: G. RODRIGUEZ	DATE STARTED 3/29/89 COMPLETED 3/29/89
METHOD: DUAL WIRE	CASING SIZE: 9 1/2"	TIP cv: 0.00 PROTECTION LEVEL: D
GROUND ELEV.: 82.8	SOIL DRILLED: 135'	WATER LEVEL: 63' TOTAL DEPTH: 135'
LOGGED BY: DH. BELAN	CHECKED BY: JFL	DATE: 4/10/89

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
						TIP	LEL
S-1	0-10			MED-DARK BROWN SAND, FINE GRAINED, POORLY GRADED, TRACE LITTLE GRAVEL	0-5.0 TUB SOIL	00.0	
S-2	10-20			GRAVEL, MODERATELY - WELL GRADED, WELL ROUNDED, WITH SOME MED BROWN FINE SAND (SW)		00.0	
S-3	20-30			GRAVEL, WELL GRADED, FINE, W LITTLE COARSE GRAVEL AND SOME FINE MED BROWN SAND (SW)	✓ CHANGE @ 30'	00.0	
S-4	30-40			GRAVEL, FINE, POORLY GRADED, WITH TRACE COARSE GRAVEL, SOME MED BROWN FINE SAND (SP)	✓ CHANGED 40'	00.0	
S-5	40-50			LT BROWN SAND, POORLY GRADED, FINE, CLEAN, TRACE VERY FINE GRAVEL (SP)		00.0	
S-6	50-60			LT BROWN SAND, POORLY GRADED, FINE, ANGULAR, WITH LITTLE FINE ROUNDED GRAVEL (SP)		00.0	
S-7	60-70			LT BROWN SAND, POORLY GRADED, FINE, SUBROUND - SUBANG, SOME VERY FINE ROUNDED GRAVEL, WET (SP)		00.0	
S-8	70-80			LT BROWN SAND, WET, POORLY GRADED FINE, TRACE FINE GRAVEL (SP)		00.0	
S-9	80-90			LT BROWN SAND, WET, POORLY GRADED FINE, CLEAN (SP)		00.0	
S-10	90-100			SIMILAR TO S-9 (SP)	✓ CHANGE @ 100'	00.0	
S-11	100-110			GRAVEL, WELL GRADED & ROUNDED WITH SOME FINE LT BROWN SAND (SW)	✓ CHANGE @ 110'	00.0	
S-12	110-120			SAND, LT BROWN, CLEAN FINE, POORLY GRADED, TRACE GRAVEL (SP)		00.0	
S-13	120-130			LT BROWN SAND, WET, POORLY GRADED FINE, WITH TRACE FINE GRAVEL (SP)		00.0	
S-14	130-135			SIMILAR TO S-13 (SP)		00.0	
				EOB 1310 HRS			

FIELD BORING LOG

BORING NO. SPN-8902C

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA-BAAP	PAGE 1	OF 2
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: S. MEUTORN	DATE STARTED 4/14/89	COMPLETED 4/14/89
METHOD: DUAL WALL	CASING SIZE: 9"	TIP EV: 10.6	PROTECTION LEVEL: D
GROUND ELEV.: 820.0	SOIL DRILLED: 140'	WATER LEVEL:	TOTAL DEPTH: 140'
LOGGED BY: BCM	CHECKED BY: JSP	DATE: 4/25/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	REL.
S-1	0-10			LT BROWN SAND, PGD, F-M, DAMP	SP	0-50 TSSAIL	0
S-2	10-20			SIMILAR TO S-1	SP		0
S-3	20-30			BROWN SAND, PGD, F-M SA, LI SI, DAMP	SP		0
S-4	30-40			BROWN SAND, PGD, F-M W/ TR-LI C SA, DAMP	SP		0
S-5	40-50			BROWN SAND, PGD, F-M, TC SA, SO F-C GRV, DAMP	SP		0
S-6	50-60			SIMILAR TO S-5 W/ CHANGE IN COLOR TO LT BROWN	SP		0
S-7	60-70			BROWN SAND, PGD TO WGD, F-M TO F-C SA W/ TR LAY, MOIST TO WET	SP/SW		0
S-8	70-80			BROWN SAND, PGD, F-M, TC SA, LI C SRD TO RD GRV, WET	SP		0
S-9	80-90			BROWN SILTY FINE SAND, F TO TR H SA, NON PLASTIC WET	SM	✓ change @ 80'	0
S-10	90-100			BROWN SAND, PGD, F-M SA, TR C SA TO F GRV, WET	SP	✓ change @ 90'	0
S-11	100-110			BROWN SAND PGD, F-M CHANGING TO WGD, F-C SA W/ SO F-C GRV, WET	SP/SW		0

FIELD BORING LOG

BORING NO. SPN-8902C

PROJECT NO.: 5753-	PROJECT NAME: USATHAMA-BAAP	PAGE 2	OF 2
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: B MELHOEN	DATE STARTED 4/14/89	COMPLETED 4/14/89
METHOD: DUAL WALL	CASING SIZE: 9"	TIP GV: 10.6	PROTECTION LEVEL: D
GROUND ELEV.: 820.0	SOIL DRILLED: 140'	WATER LEVEL:	TOTAL DEPTH: 140'
LOGGED BY: BCM	CHECKED BY: J.F.	DATE: 4/26/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
						TIP	REL.
S-12	110-120			BROWN SAND, P&G, M-C SA, TR F SA, SOME F-C GRV, WET (SP)	WATER OFF CUTTINGS HAD A RAINBOW SHEEN	0	
S-13	120-130			SIMILAR TO S-12		0	
S-14	130-140			Similar to S-12 (SP)			

FIELD BORING LOG

BORING NO. SPN-8903

PROJECT NO.: 5753-

PROJECT NAME: USATHAMA- BAAP

PAGE

OF

DRILLING CONTRACTOR: LAYNE-NORTHWEST

DRILLER: G. RODRIGUEZ

DATE STARTED 4/1/89

COMPLETED 4/13/89

METHOD: DUAL WALL

CASING SIZE: 7 1/2"

TIP EV: C.C.

PROTECTION LEVEL: D

GROUND ELEV.: 815.3

SOIL DRILLED: 150'

WATER LEVEL: 37'

TOTAL DEPTH: 150'

LOGGED BY: D.H. BEAN

CHECKED BY: GJR. 4/27/89

DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
						TIP	LEL
S-1	0-10			DARK-MEDIUM BROWN SAND, FINE-MEDIUM GRAIN, MODERATELY GRADED, WELL GRADED GRAVEL. (SP)		00.0	
S-2	10-20			MEDIUM BRN SAND, FINE, POORLY GRADED, LITTLE POORLY GRADED GRAVEL, ANGULAR (SP)		00.0	
S-3	20-30			MED-LT BRN SAND, FINE, POORLY GRADED, SOME WELL GRADED GRAVEL, ROUNDED (SP)		00.0	
S-4	30-40			SIMILAR TO S-3 (SP)		00.0	
S-5	40-50			LT BRN SAND, FINE, POORLY GRADED, SOME FINE ROUNDED GRAVEL (SP)		00.0	
S-6	50-60			GRAVEL, ROUNDED, FAIR GRADING, WITH SOME LT BRN SAND (GW)	change @ 50'	00.0	
S-7	60-70			LT BRN SAND, FINE, POORLY GRADED, 0-TRACE FINE GRAVEL (SP)	change @ 60'	00.0	
S-8	70-80			LT BRN SAND, FINE, POORLY GRADED (SP)		00.0	
S-9	80-90			SIMILAR TO S-8 (SP)		00.0	
S-10	90-100			SAND TO APPROX 94 FT. GRAVEL, ROUNDED, WELL GRADED. (GW)	change @ 94'	00.0	
S-11	100-110			GRAVEL, ROUNDED, WELL GRADED, SOME LT BRN SAND (GW)		00.0	
S-12	110-120			LT BRN SAND, FINE, POORLY GRADED, TRACE FINE GRAVEL (SP)	change @ 110'	00.0	
S-13	120-130			SIMILAR TO S-12 (SP)		00.0	
S-14	130-140			LT BRN SAND, FINE, POORLY GRADED, TRACE FINE GRAVEL (SP)		00.0	
S-15	140-150			SIMILAR TO S-14 (SP)		00.0	
				BOB @ 150', 1530 HRS.			
				ABANDON HOLE (HEAVING SAND)			

FIELD BORING LOG

BORING NO. SPN-8904 C

PROJECT NO.: 5753-09	PROJECT NAME: USATHAMA- BAAP	PAGE 1	OF 1
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: G. RODRIGUEZ	DATE STARTED 3/30/89	COMPLETED
METHOD: DUAL WALL	CASING SIZE: 9 1/2	TIP GV: 00.0	PROTECTION LEVEL: D
GROUND ELEV.: 800.7'	SOIL DRILLED: 130'	WATER LEVEL: 37 1/2'	TOTAL DEPTH: 130'
LOGGED BY: D.H. BELAN	CHECKED BY: S-R.	4/10/89	DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BGRING	MONITORING	
						TIP	LEL
S-1	0-10			DK BRN SAND, MUDDY, SILTY, FINE, WITH SOME PEBBLES (1)	ML - TOP SOIL change @ 10'	00.0	
S-2	10-20			MED BRN SAND, FINE, POORLY GRADED WITH LITTLE ROUNDED GRAVEL (SP)		00.0	
S-3	20-30			MED BRN SAND, FINE, POORLY GRADED WITH SOME MODERATELY GRADED GRAVEL ROUNDED (SP)		00.0	
S-4	30-40			MED BRN SAND, FINE-MEDIUM, POORLY GRADED WITH SOME WELL GRADED GRAVEL ROUNDED, SOME SUBANGULAR (SP)		00.0	
S-5	40-50			LT-MED BRN SAND, FINE, POORLY GRADED WET, TRACE POORLY-MODERATELY GRADED GRAVEL (SP)		00.0	
S-6	50-60			LT BRN SAND, FINE, POORLY GRADED WET, TRACE POORLY GRADED GRAVEL (SP)		00.0	
S-7	60-70			SIMILAR TO S-6		00.0	
S-8	70-80			LT BRN SAND, FINE, POORLY GRADED TO APPROX 74 FT. THEN WELL ROUNDED GRADED GRAVEL, WITH SLIGHT PETROLEUM "RAINBOW" IN WATER (GW)	change @ 74'	00.0	
S-9	80-90			GRAVEL, WELL GRADED, MOSTLY ROUNDED LITTLE SUBANGULAR, WITH SOME LT BRN FINE SAND, DARK BROWN WATER WITH SOME RAINBOW EFFECT (GW)		00.0	
S-10	90-100			GRAVEL TO 95'; THEN LT BRN FINE SAND, TRACE FINE GRAVEL (GW)	change @ 95'	00.0	
S-11	100-110			LT BRN SAND, FINE, POORLY GRADED, SLIGHT TRACE FINE GRAVEL (SP)		00.0	
S-12	110-120			LT BRN SAND, FINE, POORLY GRADED VERY SLIGHT TRACE GRAVEL (SP)		00.0	
S-13	120-130			SIMILAR TO S-12 (SP)		00.0	
				BOB @ 1020 HRS.			

FIELD BORING LOG				Boring No. DBB-91-01	
Project No 6853-03		Project Name BAAP		Page 1 of 5	
Contractor MATHES		Driller K. Bunselmeyer		Date started 10-15-91 completed 10-15-91	
Method H&T/CME 75		Casing Size 4.25"	HNU 11.7 (102)	Protection Level D	
Ground El.		Soil Drilled 115'	± below ground 2116	Total Depth 148.5	
Logged by Rth4		Checked by DRP		Date 10/16/91	

Time	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		
							HNU	LEL	
08:00 09101002	S-1	0-2	1 1/4 1/8	2.4 1.6	Bottom 0.2' - black ash and silt; trace green fine sand; Top 0.2 - 1.6 ft. brown fn. sand; trace organics, and fn. to med gr. dry. (SP)	Analytical	2.0	Bk ₂	Bk ₂
08:08 09101004	S-2	2-4	4 1/5 1/3	2.0 1.6	Top to greenish-yellow (staining) fine sand, slight chemical odor, blotches of black staining, trace clayey silt in lenses; dry; fine med. medium rounded gr. (SP).	Analytical	4.0	Bk ₂	Bk ₂
08:16 09101006	S-3	4-6	2 1/4 1/5 1/8	2.4 1.6	Bottom 0.7' - Lt brown clayey sand; trace coarse sand; Lt. middle 0.7 - 1.0' Olive fine sand, stained; trace medium sand; Lt. middle 1.0 - 1.2' Black medium sand, ash - brown; Top 1.2 - 2.0 ft. brown sandy-clay; trace medium sand, dry (SP/SP)	Analytical	5.0	Bk ₂	Bk ₂
08:27 09101008	S-4	6-8	5 1/6 1/7	2.2 1.9	yellow-green stained med. sand; trace coarse sand in seams (2") near top of spm; and medium rounded gr. ; dry (SP)	Analytical Spm in upper head.	1.0	Bk ₂	Bk ₂

FIELD BORING LOG				Boring No. <u>DBB-91-01</u>	
Project No <u>6853-03</u>		Project Name <u>BAP</u>		Page <u>2</u> of <u>5</u>	
Contractor <u>MATHES</u>		Driller <u>K. Binschmeyer</u>		Date started <u>10-15-91</u> completed <u>10-15-91</u>	
Method <u>W4/CIMR 75</u>		Casing Size <u>4.25</u>	HNU <u>11.7/103</u>	Protection Level <u>D</u>	
Ground El.		Soil Drilled <u>115'</u>	<u>2</u> below ground <u>2116</u>	Total Depth <u>116.5</u>	
Logged by <u>RHA</u>		Checked by <u>DRP</u>		Date <u>10/16/91</u>	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		SP
							HNU	LEL	
08:32 09101010	S-5	8-10	4/5/6/13	2.5/ 7.0	Bottom 0.3' - tan fine sand; trace medium sub-rounded gravel; middle 0.3-1.0' silty fn. sand, green staining; Top 1.0-2.0 olive med. sand; some fine sand; stained (green); trace coarse sand; damp SP/sm/SP	Analytical	1.0	NA	1.0
08:46 091015	S-6	13-15	7/10/19/41	2.0/ 1.7	Bottom 0.2' - Tan medium sand; trace fn. sand and HM; Top 0.2-1.7 olive (stained) fine sand, slight chemical odor; dry (SP)	Analytical	3.0	NA	7.0
08:56 091020	S-7	18-20	5/10/11/15	2.0/ 2.0	Streaked tan to olive fine sand (stained); little medium sand; dry (SP)	Analytical	2.0	NA	1.0
09:15 091025	S-8	23-24.5	7/13/18	1.5/ 1.5	Bottom 0.3' tan to black streaked silty sand; green to black liquid waste; top 0.3-1.5 Tan fine sand; dry (SM/SP)	Liquid waste at 24.5 bgs. Analytical	NA	NA	15.0

* N.A. Reference samples could not be collected.

FIELD BORING LOG				Boring No. DRB-91	
Project No 6853-03		Project Name BAAP		Page 3 of 5	
Contractor MATHES		Driller K. Rumschmeyer		Date started 10-15-91 completed 10-15-91	
Method HSA/CMA 75	Casing Size 4.25"	HNU 11.7 (102)	Protection Level D		
Ground El	Soil Drilled 115'	± below ground 2116	Total Depth 116.5		
Logged by RJA		Checked by DRP		Date 10/16/91	

Time	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		Spec
							HNU	LEL	
09:24 D9101030	S-9	28-30	11/15/13/17	2.0/ 1.9	Tan Fine Sand - ^(RH4) grading to medium sand towards bottom of spec; dry; trace medium gr. (SP)	No staining Analyzed	34	34	34
09:45 10:07 D9101042	S-10	38-40 40-41.5	11/11/12		LT. brown medium sand; trace coarse sand, medium gr. and clay; dry (SP)	SP spec refusal at 38' - drill to 40' and try again. Difficult drilling at 38' - cobbles. Analyzed No staining on Pneum tube (chloroform, PCE, CH ₂ Cl ₂)	NA	34	34
10:21 D9101044	S-11	42-43.5	7/7/13	1.5/ 1.5	Tan fine sand; little medium sand and fine rounded gr. ; trace rock frag. ; dry (SP)	Analyzed	34	34	34
10:33 D9101052	S-12	50-52	12/23/17/30	2.0/ 1.8	Tan medium sand; little fine sand; trace coarse sand and fine to medium subrounded gr. and rock frag. ; dry (SP)	Analyzed	34	34	34

FIELD BORING LOG				Boring No. DBB-91-01	
Project No 6853-03		Project Name BAAP		Page 4 of 5	
Contractor MATARS		Driller K. P. Smith		Date started 10-15-91 completed 10-15-91	
Method HSA/CMK 75		Casing Size 4.25"		HNU 11.7 (10.2)	
Ground El		Soil Drilled 115'		2' below ground 116'	
Logged by R.H.H.		Checked by DRP		Date 10/16/91	
				Protection Level D	
				Total Depth 116.5'	

Time	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		SP
							HNU	LEL	
10:47	S-13	60-68 61.5	14/26/53	1.5/ 1.5	Tan medium Sand; little fine sand; trace coarse sand and fine rounded gravel. dry, sample prepared w/H.M. (SP)	Reference	JAR/ATP	TK	TK
11:42 09101072	S-14	70-71.5	22/33/104	1.5/ 1.5	Tan medium Sand; little fine and coarse sand; trace fine rounded gravel and H.M.; dry (SP)	Analytical	TK	TK	TK
11:34	S-15	80-81.5	21/45/78	1.5/ 1.5	Tan fine and medium sand; some fine to medium subrounded gravel; trace coarse sand; dry (GW)	Reference	TK	TK	TK
3:41 09101092	S-16	90-91.5	50/55/65	1.5/ 1.5	Bottom 0.5' - Tan fine Sand; middle 0.5-1.0 Tan medium sand; trace fine to medium gravel; Top 1.0 - 1.5 Tan fine sand; dry (SP)	Analytical	TK	TK	TK
4:15	S-17	100-101.5	17/50/73	1.5/ 1.5	Bottom 0.3' - Tan med. Sand; trace coarse sand and H.M.; Middle 0.75-0.85 - Tan medium sand; some fine to medium gravel; To 0.85 to 1.5 Tan fine sand; dry. (SP)	Reference	TK	TK	TK

FIELD BORING LOG				Boring No. DBB-411	
Project No 6853-23		Project Name BAAP		Page 5 of 5	
Contractor MATHES		Driller K. Bumscheyer		Date started 10-15-91 completed 10-15-91	
Method HSA / cm 175		Casing Size 4.25"		HNU 11.7 (10.2)	
Ground El		Soil Drilled 115'		2' below ground 2116	
Logged by ZHA		Checked by DRP		Date 10/16/91	
				Protection Level D	
				Total Depth 116.5	

Time	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		SP
							HNU	LEL	
14:31 D9101112	S-18	110-116.5	15/30/80	1.5/ 1.5	Tm fine sand; trace coarse sand; dry.	Analytical	JAR BL	ATR BL	Bkg
14:50 D9101117	S-19	115-116.5	11/20/31	1.5/ 1.5	Bottom 1.0' - Tm medium sand, little fine sand; trace coarse sand and fine grl.; wet. Top 1.0-1.5' Tm fine sand; clay layer (1") near top of spoon; dry.	Analytical T.D. 116.5	Bk	Bk	Bkg

FIELD BORING LOG				Boring No. DBB9102	
Project No. 615303		Project Name USATHAMA BAAP		Page 1 of 3	
Contractor MATHEIS		Driller T. CRANK		Date started 10-15-91 completed 10-16-91	
Method HSA 4 1/4"		Casing Size —		HNU 11.7 (102) #3 Protection Level D	
Ground EL		Soil Drilled 120'		# below ground 118 Total Depth 122'	
Logged by D. DUCKS		Checked by DRP		Date 10/16/91	

	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
							HNU	LEL
1030	S-1	0-2	2/4/13/14	2.0 1.7	DARK BROWN SILT GRADING TO LT TAN FINE GRAY SAND, 2" BLACK FLAKE OF ASH OVER OLIVE GRAY SILT & GRAVEL, FILL	Reference Sample	0	0
1035	S-2	2-4	7/7/7/7	2.0 1.2	DARK BROWN SAND w/ WELL ROUNDED GRAVEL GRADING TO DARK BROWN CLAY, MOIST, STIFF, FILL	ANALYTICAL SAMPLER D9102004	15	0
1045	S-3	4-6	3/9/14/16	2.0 1.8	SILTY (CLAY TO SILT SAND), TO FINE SAND, DARK BROWN TO TAN, WELL ROUNDED GRAVEL	ANALYTICAL SAMPLER D9102006	0	0
1056	S-4	6-8	5/7/9/13	2.0 1.6	MED BROWN FINE SAND w/ WELL ROUNDED PEBBLES / GRAVEL GRADING INTO LIGHT TAN MEDIUM SAND (WELL SORTED), MED	ANALYTICAL SAMPLER D9102008	0	0
1100	S-5	8-10	5/8/10/13	2.0 1.6	LIGHT TAN MED SAND w/ WELL ROUNDED PEBBLES	ANALYTICAL / REF SAMPLER D9102010	0	0
1110	S-6	10-12	9/12/12/11	2.0 2.0	MED BROWN SAND & GRAVEL GRADING INTO LIGHT TAN FINE SAND (WELL SORTED)	ANALYTICAL SAMPLER NOT SENT	0	0
1115	S-7	12-14	3/5/7/7	2.0 2.0	LIGHT TAN, WELL SORTED FINE SAND, LOOSE, DRY	ANALYTICAL SAMPLER D9102014	0	0
1120	S-8	14-16	4/7/9/8	2.0 2.0	LIGHT TAN, WELL SORTED FINE SAND, LOOSE, DRY	ANALYTICAL SAMPLER D9102016	0	0
1130	S-9	16-18	2/6/10/11	2.0 1.7	LIGHT TAN, FINE SAND w/ COARSE GRAVEL, WELL SORTED, LOOSE, DRY	ANALYTICAL SAMPLER NOT SENT	0	0

FIELD BORING LOG				Boring No. DBB-11-01	
Project No. 685303		Project Name USATHAMA BAAP		Page 2 of 3	
Contractor MATHES		Driller T. CRANK		Date started 10-15-91 completed 10-16-91	
Method HSA 4 1/4"		Casing Size —		HNU 11.7 (102) #3 Protection Level D	
Ground El.		Soil Drilled 120'		2' below ground 118' Total Depth 122'	
Logged by D. DUCK		Checked by DRP		Date 10/16/91	

SPEC. BRITANNIC
ZONES

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
1135	S-10	18-20	5/12/13/14 2.0 2.0	SAME AS S-9	ANALYTICAL SAMPLER D9102020	0	0
1140	S-11	20-22	6/10/11/7 2.0 2.0	LIGHT TAN FINE SAND GRADING TO LIGHT TAN MED. SAND W/ WELL ROUNDED PEBBLES (10%), LOOSE	ANALYTICAL SAMPLER NOT SENT	0	0
1326	S-12	25-27	4/11/23/20 2.0 2.0	LIGHT TAN FINE SAND W/ A 4" SAND SAND & WELL ROUNDED GRAVEL MIX, LOOSE	ANALYTICAL SAMPLER D9102027	0	0
1395	S-13	30-32	8/26/24/23 2.0 2.0	LIGHT TAN FINE SAND, DRY, LOOSE	REFERENCE SAMPLE	0	0
1345	S-14	40-42	2/7/5/8 2.0 1.8	LIGHT TAN FINE SAND GRADING INTO TAN SILT, SUB ROUNDED TO ROUNDED GRAVEL (15%) SCATTERED THROUGHOUT, SLIGHTLY MOIST, LOOSE	ANALYTICAL SAMPLER D9102042	0	0
	S-15	50-52	10/19/26/19 2.0 2.0	SUB-ROUNDED TO ANGRY TAN FINE SAND W/ ANGRY QUARTZITE ROCK TO 2" LONG (30%) MOIST, LOOSE	REFERENCE SAMPLER D9102052	0	0
1430	S-16	60-62	8/30/50 1.5 1.5	BROWN COARSE SAND W/ ROUNDED PEBBLES TO LIGHT TAN FINE SAND (WELL SORTED) TO MEDIUM TAN SAND W/ ROUNDED PEBBLES, LOOSE, MOIST	ANALYTICAL SAMPLER D9102062	0	0

FIELD BORING LOG				Boring No. DBB-91-02	
Project No 685303		Project Name USATHAMA BAAP		Page 3 of 3	
Contractor MATHES		Driller T. CRANE		Date started 10-15-91 completed 10-16-91	
Method 4 1/4" A 4 1/4"		Casing Size —		HNU 112(102) # 3	
Ground El.		Soil Drilled 120		± below ground 118	
Logged by D. LOCKS		Checked by DRP		Date 10/16/91	
				Protection Level D	
				Total Depth 122	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-17	70-72	6 1/12/15	2.0 3.0	TAN, COMMON SAND W/ WELL ROUNDED GRAVELS TO FINE LIGHT TAN SAND W/ WELL ROUNDED GRAVELS, MOIST, LOOSE	ANALYTICAL SAMPLE D9102072	0	0
S-18	80-82	14/48/50 4"	1.33 1.33	LIGHT TAN, FINE SAND W/ WELL ROUNDED GRAVELS (5%), MOIST, LOOSE	REFERENCE SAMPLE	0	0
S-19	90-92	23/50/45/50	2.0 2.0	LIGHT TAN FINE SAND W/ GRAVEL RANGING FROM .5 INCHES TO 1.5 INCHES, WELL ROUNDED, DRY, MOIST	ANALYTICAL SAMPLE D9102092	0	0
S-20	100-102	26/45/50 4"	1.33 1.33	LIGHT TAN FINE SAND W/ SORTED, WELL ROUNDED GRAVEL RANGING FROM .5 INCHES TO 1.25 INCHES, DRY, MOIST	REFERENCE SAMPLE	0	0
S-21	110-112	25/50/50 3"	1.25 1.25	TAN, FINE SAND, WELL SORTED, DRY, MOIST	ANALYTICAL SAMPLE D9102102	0	0
S-22	120-122	2/3/2/2	2.0 2.0	TAN, FINE SAND, WELL SORTED, WET, VERY LOOSE	ANALYTICAL SAMPLE D9102122	0	0
				BOB AUGERS 120' SPLIT SPOON 122'			

SPIN BREASTING ZONE

FIELD BORING LOG				Boring No. pBB-91	
Project No 6853-03		Project Name BAAP		Page 1 of 5	
Contractor MATHES		Driller K. Benschmeyer		Date started 10-16-91 completed 10-16-91	
Method HSA/CME 75		Casing Size 4.25"		HNU 11.7K(102)	
Ground El.		Soil Drilled 120'		Protection Level D	
		& below ground 118'		Total Depth 122'	
Logged by RHA		Checked by DRP		Date 10/16/91	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		SP
							HNU	LEL	
07:42	S-1	0-1.5	5/6/12	1.5/ 1.1	Brown fine sand; some med. sand; trace coarse sand, fine to med. gravel, and organics; dry (SP)	Reference Rocky drilling	JAR Bk ₂	AK ₁	B ₂
08:00 09103004	S-2	2.0-3.5	7/16/30	1.5/ 1.3	Brown fine and med. sand; little fine to med. gravel; trace rock frags. and organics; dry (SW)	Analytical Rocky drilling	Bk ₂	Bk ₂	B ₁
08:04	S-3	4.0-5.5	21/30/28	1.5/ 1.2	Brown fine to coarse sand; some fine to coarse gravel; little rock frags.; dry (SW) sweet odor	Reference	Bk ₂	Bk ₂	Bk ₂
08:17 09103008	S-4	6-7.5	15/15/11	1.5/ 1.0	Brown fine to coarse sand; some fine to medium regular gravel; dry (SW)	Analytical	Bk ₂	Bk ₂	B
08:28	S-5	8.0-9.5	11/16/24	1.5/ 1.1	Olive fine sand; ^{little} med. sand and fine to med. gravel; dry. Sweet chemical odor. (SW)	Reference Not enough recovery - sampling ~ 24" spec.	Bk ₂	Bk ₂	B ₁
08:36 09103012	S-6	10-12	13/24/36/50	2.7/ 1.0	Olive med. sand; little fine regular gravel; trace coarse sand and rock frags.; sweet odor; dry (SW)	Analytical	Bk ₂	Bk ₂	B

FIELD BORING LOG				Boring No. DBB-91-03	
Project No 6853-03		Project Name BAAP		Page <u>2</u> of <u>5</u>	
Contractor MATHES		Driller K. Burselmeyer		Date started 10-16-91 completed 10-16-91	
Method HSA/CME 75		Casing Size 4.25"		HNU 11.71(10.2)	
Ground El		Soil Drilled 120'		2' below ground/118	
Logged by RHA		Checked by DRP		Date 10/16/91	
				Protection Level D	
				Total Depth 122	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		Sieve Span
							HNU	LEL	
08:54 09103014	S-7	12-14	16/17/16/16	2.0/ 1.8	Bottom 1.2' Olive (stained) fine sand; Top 1.2-2.0 brown medium sand; little fine sand; trace coarse sand and fine to medium gravel; sweet odor; dry (SP)	Analytical	JAR	AIR	1.0
09:03 09103016	S-8	14-16	4/5/12/14	2.0/ 1.8	Bottom 0.5' Tan to olive (stained) med. sand; trace fine sand; Top 0.5-1.8' Olive (stained) fine sand; trace coarse sand, sweet odor; dry (SP)	Analytical	B ₂	B ₂	B ₂
09:12 09103018	S-9	16-18'	7/11/15/22	2.0/ 2.0	Bottom 1.7' Tan fine sand; trace med. sand; To 1.7 to 2.0 Olive (stained) fine sand; trace med sand; dry (SP)	Analytical	B ₂	B ₂	B ₂
09:20 09103020	S-10	18-20'	9/16/33/21	2.0/ 2.0	Bottom 1.3' Tan fine sand; trace med. sand; H.M. and X-bedding; Top 1.3-2.0 or brown silty fine sand; trace med sand; dry. (SP/SM).	Analytical	B ₂	B ₂	B ₂
9:26 09103022	S-11	20-22	9/18/20/32	2.0/ 2.0	Bottom 1.6' Tan fine sand; little medium sand; trace H.M.; top 1.6-2.0 or brown fine sand; some silt; trace med. sand; dry (SP/SM)	Analytical	B ₂	B ₂	B ₂

FIELD BORING LOG				Boring No. DBB-91-03	
Project No. 6853-03		Project Name BAAP		Page 3 of 5	
Contractor MATHES		Driller K. Burselmeyer		Date started 10-16-91 completed 10-16-91	
Method HSA/LME 75		Casing Size 4.25"		HNU 11.7 (102)	
Ground El.		Soil Drilled 120'		2' below ground 118'	
Logged by RHA		Checked by DRP		Date 10/16/91	
				Protection Level D	
				Total Depth 122	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		
							HNU	LEL	
09:37 09103027	S-12	25-27	7/15/18/25	2.0 1.9	Tan fine sand; little med. sand; lt. brown silty fine sand section (18') 0.8' from bottom; trace H.M.; dry (SP)	Analytical	JAR	ATR	BSK
09:45	S-13	30-32'	18/24/40/40	2.0 2.0	Bottom 0.1 lt. brown fine sand; little med. sand; middle 0.1 - 1.6' Tan fine sand; little med. sand; trace coarse sand and H.M.; top 1.0 - 2.0 lt. brown med. sand; trace fine and coarse sand and fine rounded gravel; dry (SP)	Reference	BS	BSK	
10:04 09103042	S-14	40-42	15/26/35/45	2.0 1.7	Tan med. Sand; little fine and coarse sand and fine to medium sub rounded gravel; trace rock fragments; dry. (SW)	Analytical	BS	BSK	B
10:20	S-15	50-52	12/18/24/30	2.0 1.8	Bottom 0.8' - lt brown med sand; some fine gravel and coarse sand; little fine sand; top 0.8 - 1.8 Tan fine sand; trace medium to coarse sand and fine rounded gravel. dry. (GW/SP)	Reference coulter at 55'	BS	BSL	BS

FIELD BORING LOG				Boring No. DBB-91-03	
Project No 6853-03		Project Name BAAP		Page 4 of 5	
Contractor MATHES		Driller K. Russel Meyer		Date started 10-16-91 completed 10-16-91	
Method HSA/CME 75		Casing Size 4.25	HNU 11.7K(102)	Protection Level D	
Ground El		Soil Drilled 120'	± below ground 118	Total Depth 122'	
Logged by RHA		Checked by DRP		Date 10/16/91	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		Spec. Spec.
							HNU	LEL	
10:51 D9103022	S-16	60-62	20/38/54/50	2.0 2.0	Tan fine Sand; trace med. and coarse sand; thin beds (1/4 - 1/8") of alternating Lt. brown silty fine sand and tan medium to coarse sand; dry. (SP)	Analytical	JAR	ATP	Bl
11:20	S-17	70-72	5/19/25/16	2.9 1.7	Tan fine Sand; little med. sand in lenses; trace coarse sand; trace fine gravel and H.M.; dry.	Reference Gravel at 75'	Bl	Bl	Bl
11:47 D9103082	S-18	80-82	20/33/55 50 for 2"	1.7 2.0	Tan fine sand; little medium sand and fine rounded gravel; trace coarse sand and medium to fine coarse gravel; dry	Analytical	Bl	Bl	Bl
14:00	S-19	90-92	12/20/37/20	2.9 2.0	Tan fine Sand; trace medium and coarse sand and fine rounded gravel. dry. (SP)	Reference.	Bl	Bl	Bl
14:26 D9103102	S-20	100-102	15/28/50 20 for 3"	1.75 2.0	Bottom 1.7' Tan fine Sand; little medium Sand; trace coarse sand and H.M.; top 1.7 - 2.0 Brown fine sand; trace medium sand; dry (SP)	Analytical	Bl	Bl	Bl

FIELD BORING LOG				Boring No. DBB-9	
Project No 6853-03		Project Name B.44P		Page 5 of 5	
Contractor MATTHEWS		Driller K. Rindmeyer		Date started 10-16-91, completed 10-16-91	
Method HSA/ME 75		Casing Size 4.25"		HNU 11.7 (10.2)	
Ground El		Soil Drilled 120'		2' below ground 118'	
Logged by RHA		Checked by DRP		Date 10/16/91	
				Protection Level D	
				Total Depth 122'	

Time	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		
							HNU	LEL	
15:00	S-21	110-112	13/27/35/42	2.0/ 2.0	Tan fine sand; little medium sand; trace coarse sand and fine rounded gravel. LT brown silty fine sand 10" (1") 1.5' from bottom of screen; dry (SP)	Reference Cobbles at 116'	TAR 34	ATR 34	TS TS
15:47 DS103122	S-22	120-122	5/11/20/19	2.0/ 2.0	Tan Fine Sand; + trace medium sand; <u>wet</u> (SP)	118' T.D. 122 Analyzed	34	34	TS

FIELD BORING LOG

BORING NO. DBB-8901

PROJECT NO.: 5753-08

PROJECT NAME: USATHAMA-BAAP

PAGE 1 OF 3

DRILLING CONTRACTOR: LAYNE-NORTHWEST

DRILLER: Bear Roo Pae

DATE STARTED 1/17/89

COMPLETED 1/20/89

METHOD: HSA

CASING SIZE: 41.85" ID

TIP EV: #75

PROTECTION LEVEL: C-dernal

GROUND ELEV.: 899.5

SOIL DRILLED: 120.5'

WATER LEVEL: 120 ± 8"

TOTAL DEPTH: 120.5'

LOGGED BY: PLO/BM

CHECKED BY: J.R. 2/27/89

DATE: 1/17/89

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	HEADS
5-1	0-2'	27-35-42-43	2.0 2.0	0-2 lg br to br organic .2-.8' lg br to br med to fi sa to coarse poorly graded, loose, damp .8-1.0 clay lens, olive brown, plastic damp (clay cap?) plastic w/ right on top of the clay. 1.0-2.0 - lg br to brown med to fi, trace sa, poorly graded, loose, damp			BK5 BK5
-2	2-4'	34-25-20-16	2.0 1.8	0-.8 - AS above .8-1.4 - Black med to fi sand (Burn layer) Tr coarse, poorly graded loose, moist 1.4-1.7 br to lg brown clay, plastic, firm moist 1.7-1.8 br to lg brown med to fi sa poorly graded, loose, moist	Took Analytical (Fill)		3.2-3.9
5-3	4-6'	8-7-7-7	2.0 2.0	0-.4 Black med to fi sa to coarse poorly graded, loose moist .4-2.0 olive br med to fi sa, poorly graded loose moist (SP)	Took Analytical (Fill)		10.3-2.6
5-4	6-8'	5-3-2-10	2.0 1.9	0-1.5 olive to lg brown (varied colors) fi to i sa well graded, loose, moist, well stratified, firm brown (SP) 1.5-1.9 light tan med to fi sa, poorly graded, loose, moist (SP)	Took Analytical (Fill)		-3.6-4.0

Bk 2 - 4.9

Bk 2 - 4.9

FIELD BORING LOG

BORING NO. 0366401

PROJECT NO.: 5753-08

PROJECT NAME: USATHAMA- BAAP

PAGE 2 OF 3

DRILLING CONTRACTOR: LAYNE-NORTHWEST

DRILLER: R.D. Pae

DATE STARTED 1/17/89

COMPLETED 1/20/89

METHOD: HSA

CASING SIZE: 4.85' 10

TIP GV: #15

PROTECTION LEVEL: C Dermal

GROUND ELEV.: 899.5

SOIL DRILLED: 120.5'

WATER LEVEL: 120.0'

TOTAL DEPTH: 120.5'

LOGGED BY: PLB/BM

CHECKED BY: JSA 2/27/89 DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	REL. JEL. (lb/ft ³)
S-5	8-10'	10-25-21-27	2.0 1.6	0-1.6 lg br to br med to fi sa tr c Tr gr, loose, moist, well graded (SW)	Analytical (Active) change @ ~ 8.5'	3 kg	-3.9
S-6	13-15'	4-9-11-19	2.0 2.0	lg br to ten fi sa tr med, poorly graded, loose, moist, olive (staining?) stratification between 10-1.6 (SP)	Analytical	6 kg	-3.6
S-7	18-20'	7-11-16-23	2.0 1.8	lg br to ten fi sa tr med poorly graded loose, moist, olive staining from 1.6-1.7 (stratification) coarse sand lens at .5-.6 0-.5 - completely stained olive color (SP)	Analytical	30.1	-2.3
S-8	23-25'	13-23-25-35	2.0 2.0	Ten fi sa tr med, poorly graded, loose, moist, olive staining in layers throughout the spoon. (SP)	Analytical	27.4	0
S-9	28-30'	11-26-40-43	2.0 1.6	Ten fi sa to med sa tr c, loose, moist, poorly graded, well stratified, some layers 3" thick (SP)	Analytical	6 kg	-3.5
S-10	38-40'	12-40-66-100	1.5 1.4	0-1.1 dk tan to olive fi sa, dry to moist as you go down the spoon, very dense 1.1-1.4 Beige silt, tr very fi sand, non plastic, moist, very stiff (SP)	Analytical	1800	12.9
S-11	40-42'	23-35-34-28	2.0 1.6	0-.9 dk Beige silt, tr very fi sa med in moisture as you go down to saturated at 7-.9 (nonplastic, stiff) (MW) .9-1.6 dk Beige fi to med sa tr coarse, tr sg well graded, moist, compact (SW)	Analytical silt contact change @ 40'	13.4	-2.1
S-12	42-44'	23-50-91-40	2.0 1.7	0-.3 dk olive fi sa tr med, poorly graded .3-1.7 dk Beige fi to med sa tr c, tr fi med gr, well graded, damp, dense (SW) black micaceous lens at 1.1-1.4	Analytical	8.6	-2.9

0.3 = 1.4

FIELD BORING LOG

BORING NO. DBB-8901

PROJECT NO.: 5753-00	PROJECT NAME: USATHANA-BAAP	PAGE 3 OF 3
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: Rod Fre	DATE STARTED 1/17/89 COMPLETED 1/29/89
METHOD: HSA	CASING SIZE: 4.25" ID	TIP Ø: 1.5" PROTECTION LEVEL: C Dermal
GROUND ELEV.: 899.5	SOIL DRILLED: 120.5'	WATER LEVEL: TOTAL DEPTH: 120.5'
LOGGED BY: PLB/BM	CHECKED BY: J.K. 2/27/89	DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
						TIP	WATER
S-13	52-54'	75-100 ^{red}	$\frac{.9}{.3}$	Beige fi. to med sa, Tr c, Tr fi gr, poorly graded, compact, moist (SP)	Refused at 9' No Analytical	BKs	-3.7
S-14	62-64'	20-55-57-92	$\frac{2.0}{1.5}$	Lt tan to tan med to fi sa, Tr c, Tr fi gr, poorly graded, very dense, moist gravel layer at .8-1.0 (SP)	Took Analytical still in cobbles	BKs	-4.0
S-15	72-74'	10-21-44-66	$\frac{2.0}{1.6}$	As above but w/out gr layer	No Analytical	BKs	-4.0
S-16	82-84'	17-44-76-98	$\frac{2.0}{1.6}$	Lt tan to tan fi to med sa, Tr c, Tr fi gr, poorly graded, very dense, moist, some stratification from F to c w/ depth (SP)	Took Analytical	BKs	-3.9
S-17	92-94'	38-53-82-104	$\frac{1.9}{1.8}$	Tan fi to med sa, poorly graded, very dense, moist, some stratification c layers at .5-.6 and .9-1.1 (SP)	No Analytical	BKs	BKs
S-18	102-104'	28-63-65-76	$\frac{2.0}{1.3}$	Tan fi to med sa, Tr c, Tr c gr, poorly graded, very dense, moist, some stratification (SP)	Took Analytical	BKs	BKs
S-19	112-114' Σ 113.59	21-61-100	$\frac{1.4}{1.1}$	Tan fi to med sa, Tr c, poorly graded, very dense, moist (SP)	Took Analytical	BKs	BKs
S-20	122-124'	7-7-20-20	$\frac{2.0}{1.3}$	Tan fi to med sa, Tr c, poorly graded, very dense, saturated (SP)	Took Analytical	BKs	BKs
Boss e 120.5							

BKs ≈ -3.2

FIELD BORING LOG

BORING NO. DBB4902

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA-BAAP	PAGE 1 OF 3
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: F. Hein 2	DATE STARTED 1/10/89 COMPLETED 1/11/89
METHOD: 4.25" HSA	CASING SIZE: 4.25"	TIP cv: 10.0 RE#/ PROTECTION LEVEL: D
GROUND ELEV.: 897.9	SOIL DRILLED: 117	WATER LEVEL: 113 TOTAL DEPTH: 117
LOGGED BY: J. Snowdon	CHECKED BY: 2/27/89	DATE:

SAMPLE NO.	DEPTH IN FEET B.P.	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING		REMARKS
						TIP	LEL	
S-1	0-2	18/15/15	1.5 1.8	Tan & Black si m-f sa w/ trace m gvl, dry, m. dense, w. graded, nonplastic Fill	Analytical Not Taken	0	0	3.3
S-2	2-4	5/9/11/12	2.0 1.2	Dr Brown clayey si w/ trace f-m sa, moist, stiff, p. graded, mod. plastic Fill	Analytical Taken	0		
S-3	4-6	9/7/7/4	2.0 1.6	Dr Brown clayey si w/ trace f-m sa grading to a Brown si m-f sand w/ some med. gvl, moist, loose to firm, p. graded to w. graded, mod. plastic to nonplastic Fill	Analytical Taken -Change @ 5.5'	0	0	
S-4	6-8	4/3/6/11	2.0 1.6	Upper .6 similar to bottom of S-3 .6-1.6-Tan f-m sa w/ little si, trace gvl, moist, loose, well graded, nonplastic Fill - SP	-Change @ ~ 7.5' Analytical NOT Taken	0	0	
S-5	8-10	NS	0	Not sampled due to drill bit error				
S-6	10-12	17/18/13/8	2.0 1.7	Tan-Lt Brown m-f sa w/ trace little si, moist, loose, well graded (some med rounded gvl), nonplastic SP	Analytical Taken	0	0	
S-7	12-14	2/8/10/13	2.0 1.8	Similar to S-6 w/ > med.-f round gvl -sweet odor headspace = 0.3	-Analytical Taken	0	0	
S-8	14-16	3/10/11/16	2.0 1.6	Similar to S-6 (sand becoming more stratified w/ depth)	-Analytical Taken	.3	0	
S-9	16-18	9/11/16/21	2.0 2.0	Similar to S-6	Analytical Not Taken	0	0	
S-10	18-20	NS		Not Sampled				

FIELD BORING LOG

BORING NO. DBB8902

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- SAAP	PAGE 2 OF 3
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: F. HEINZ	DATE STARTED 1/10/89 COMPLETED 1/11/89
METHOD: H24	CASING SIZE: 4.75"	TIP cv: 10.0 TE PROTECTION LEVEL: D
GROUND ELEV.: 897.9	SOIL DRILLED: 117	WATER LEVEL: 113 TOTAL DEPTH: 117
LOGGED BY: J. Snowden	CHECKED BY: J. K. 2/27/89	DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-11	20-22	11/11/22/26	2.0 2.0	Similar to S-6	Advanced boring to 25' to complete drilling 1/10 Analytical taken		
S-12	25-27	7/11/24/22	2.0 2.0	Coarse sand, some med. sand, dry, fairly well sorted, brown. (20' fn. gravel lens (a) 1.4 ft.) (SP)	Analytical taken	0	0
S-13	30-32	8/15/22/34	2.0 2.0	30-31.3 Med sand, well sorted, dry, brown (SP) 31.3-32 Fine sand well sorted, dry, brown, (SP)	Analytical taken	0	0
S-14	40-42	11/21/25/30	2.0 2.0	40-40.7 Coarse med. sand, tr. of fn. gravel, poorly sorted, moist, brown (SW) 40.7-41.4 Silt, brown, moist (SM) 41.4-42 Med. & fn. sand, tr. of fn. gravel, moist, oxidized lensing (SW) brown, P. sorted	Analytical taken	0	0
S-15	50-52	21/35/50	1.5 1.0	med. sand, trace fn. sand, trace fn. gravel, trace coarse sand, poorly sorted, moist, brown. (SW)	Reference sample only		
S-16	60-62	45/62/94/50	1.5 1.5	Coarse sand & fn. gravel some med. sand very poorly sorted trace of med. gravel moist, brown (SW) GP	Analytical taken contact @ 70.7 med. sand to gravel	0	0
S-17	70-72	10/41/100	1.8 1.8	Coarse sand, tr. of fn. gravel, brown, dry, poorly sorted. (SW)	reference sample only	0	0
S-18	80-82	4/23/42/75	2.0	same as S-17	Analytical taken	0	0

BORING NO. 0308402

PROJECT NAME: USATHAMA- BAAP

PAGE 3 OF 3

DRILLER: *F. Heinz*

DATE STARTED 1/10/89 COMPLETED 1/11/89

METHOD: 425" HSA

CASING SIZE: 4.25 "

TIP eV: 10.0 7E

PROTECTION LEVEL: **A**

GROUND ELEV.: 897.9

SOIL DRILLED: 117

WATER LEVEL: 113

TOTAL DEPTH: 117

LOGGED BY: *D. Dittman*

CHECKED BY:  2/27/89 DATE:

SAMPLE NO.	DEPTH IN FEET	BLGS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING		WET SPA
			REC.			TIP	LEL	
S-19	90-92	9/20/26/46	$\frac{2.0}{1.0}$	coarse sand? fin. gravel brown dry, poorly sorted grading into a well sorted, brown, coarse sand (SW)	Ref. sample only Analytical taken	0	0	
2320	100-102	75/50 for .2	$\frac{1.2}{1.0}$	med. sand, brown, dry, well sorted (SP) Siliceous cobble present in spoon at approx. 100 ft.	Ref. sample only	0	0	
S-21	110-112	9/25/50 for .2	$\frac{1.2}{1.2}$	Same as S-21 (minus the siliceous cobble) (Sample wet @ the dip of the spoon)	Analytical taken	0	0	
S-22	115-117	12/25/18 /23	$\frac{2.0}{1.0}$	coarse sand, brown, fairly well sorted, brown (SW), WET At approx 115' there is a very thin silt layer, grey, wet.	Analytical taken	0	0	
<p>E.O.B. : 113.7</p> <p>WATER TABLE: 113</p>								



FIELD BORING LOG

BORING NO. D588963

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA- BAAP	PAGE 1 OF 2
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: F. Henz	DATE STARTED 1/7/89 COMPLETED
METHOD: 4.25" HSA	CASING SIZE: 4.25"	TIP GV: 10.0 TE PROTECTION LEVEL: D
GROUND ELEV.: 897.8	SOIL DRILLED: 122'	WATER LEVEL: 119' TOTAL DEPTH: 122'
LOGGED BY: J. Southern	CHECKED BY: JSA 2/27/89	DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-1	0-2	6/4/12/8	2.0 1.7	Brown m-f sand w/ trace silt, & m gvl, dry, sorted, nonplastic, loose SP	- nose of s/s has si clay	0	0
S-2	2-4	6/15/15/20	2.0 1.6	similar to S-1 - si clay layer @ 2.0'	- top of s/s has si clay Analytical taken	0	0
S-3	4-6	12/24/34/25	2.0 1.1	Similar to S-1 w/ 7 gvl & cob	Analytical Taken	0	0
S-4	6-8	32/56/40/17	2.0 0.7	lt Brown silty m-f sand w/ some m-c gvl, loose, dry, w. graded, nonplastic SP	- Change @ ~ 6.5'	0	
S-5	8-10	17/17/15/23	2.0 1.5	Brown silt m-c sand w/ some m gvl, loose, moist, w. graded, nonplastic w/ apparent solvent odor	Analytical taken - Change @ 9.5' to	0	0
S-6	10-12	30/30/22/17	2.0 1.4	lt Br-Tan m-f sand w/ trace silt + little m-gvl, loose, moist, w. sorted sweet odor cont. (SP)	Analytical taken	1.0	
S-7	12-14	6/13/14/23	2.0 1.3	Similar to S-6 w/ sweet odor (SP)	Analytical Taken	.9	0
S-8	14-16	24/25/32/30	2.0 2.0	Similar to S-6 sweet odor (SP)	Analytical Taken	0	
S-9	20-22	22/56/100/00	1.5 0.8 1.5	Similar to S-6 w/ tan clayey si lenses contact w/ si lenses @ ~ 21' (SP)	Analytical Change @ 21'	0	
S-10	25-27	18/34/98/50	2.0 2.0	Similar to S-9 No ref. sample (SP)	Analytical Taken	0	
		Head Space screening of ref. samples		sample PE S-1 — .3 S-2 — 0.2 S-3 — 0.2 S-4 — 0.5 S-5 — 0.3 S-6 — 0.5 S-7 — 0.2 S-8 — 0.5 S-9 — 0.5 S-10 empty			

S-10 EMPTY

FIELD BORING LOG

BORING NO. DBB-8903

PROJECT NO.: 5753-05

PROJECT NAME: USATHAMA-BAAP

PAGE 2 OF 2

DRILLING CONTRACTOR: LAYNE-NORTHWEST

DRILLER: F. Hein

DATE STARTED 1/7/89

COMPLETED 1/9/89

METHOD: 4.25" HSA

CASING SIZE: 4.25"

TIP EV: 10.0 TC

PROTECTION LEVEL: D

GROUND ELEV.: 897.8

SOIL DRILLED: 122'

WATER LEVEL: 49.8 122'

TOTAL DEPTH: 122' 49.9 122'

LOGGED BY: D. D. Hmar

CHECKED BY: J. P. 2/27/89 DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-11	30-32	34/35/32/23	1.5 1.5	Med. sand brown, trace fn. sand, dry. 31.5'-32.0', med. sand, and fine gravel. poorly sorted (SP)	Analytical sample	0	0
S-12	40-42	36/33/35/56	2.0 2.0	Med. sand and fine gravel, brown, trace fn. sand, some coarse sand, moist, very p. sorted.	Analytical sample	0	0
S-13	50-52	43/60/100 for .3'	1.3 1.3	SAME AS S-12, coarse-fine 3" sand lense @ 50.8' (SW)	Analytical sample	0	0
S-14	60-62	24/49/60/51	2.0 2.0	Fine sand, some med. sand, well sorted, brown, fairly dry. (SP)	-cobbles in tip of ss -cobbles noted in auger spoils @ approx. 60 ft. Analytical sample	0	0
S-15	70-72	53/91/89/100	2.0 2.0	70-71 - coarse sand: fn. gravel, brown, p. sorted, dry. (SW) 71-72 - med. sand, tr. of coarse sand, brown, fairly well sorted, dry. (SP)	reference sample only	0	0
S-16	80-82	14/15/17/23	2.0 2.0	same as S-15, 70-71	Analytical sample	0	0
S-17	90-92	17/33/47/46	2.0 2.0	90-91.5 coarse sand, brown, tr. fn. gravel, p. sorted, dry. (SW) 91.5-92 med and fn. sand, brown, fairly well sorted, dry (SP)	ref. sample only.	0	0
S-18	100-102	20/24/21/21	2.0 2.0	same as S-17 91.5-92	ref. sample only.	0	0
S-19	110-112	19/32/50/46	2.0 2.0	Coarse med sand, brown, fairly well sorted, wet @ 111.5 ft. (SP) # Spoon used as plug to drill to 120.	I encountered during drilling at 119.8' Ref. sample only.	0	0
S-20	120-122	Blow in sands.	2.0 2.0	med. & fine sand, brown, fairly well sorted wet (SP)	Analytical sample -not able to collect and disturbed	0	0

BOB @ 122'

sample do to
blow in running
and in the air

FIELD BORING LOG

BORING NO. DBB-903

PROJECT NO.: 5733- CS	PROJECT NAME: USATHAMA- BAAP	PAGE 3 OF 3
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: F. HEINS	DATE STARTED 1/2/84 COMPLETED 1/2/84
METHOD: 4.25" HSA	CASING SIZE: 4.25"	TIP W: 10.0 TE PROTECTION LEVEL: D
GROUND ELEV.: 897.8	SOIL DRILLED: 122'	WATER LEVEL: 122' TOTAL DEPTH: 122'
LOGGED BY:	CHECKED BY:	DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING
			REC.			
				READ SPARE SCREENING OF REFERENCE SAMPLES		
				SAMPLE	PI READINGS (MM)	
				S-11	0.1	
				S-12	0.1	
				S-13	0.1	
				S-14	0	
				S-15	0.4	
				S-16	1.1	
				S-17	0.1	
				S-18	0.4	
				S-19	0.1	
				S-20	0.1	
				7 BACK BROWND		

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. DBB-82-01Surface Elevation 895Job No. C.10313Sheet 1 of 2

1409 EMIL STREET • P.O. BOX 9536, MADISON, WIS. 53715 • TEL. (608) 257-4846

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				W	LL	PL	D	
No.	Type	↓	↓	N	Depth						
1	SS	18"	M	3		FILL: Mixture of Silty Clayey Sand, Cinders & Tar Paper					
2	SS	12"	M	16	5						
3	SS	12"	M	24		Medium Dense to Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Medium SAND, Little Silt & Clay, Trace to Little Gravel, Occasional Cobbles (SP-SM) Less Silt & Clay Present from 8' to 15' Boring Completed to 10' on 3/10/82					
4	SS	12"	M	26	10						
5	SS	15"	M	20	15						
6	SS	12"	M	15	20						
7	SS	12"	M	49	25	Dense, Pale Brown (10YR 6/3) Fine to Coarse SAND, Some Gravel, Little Silt (SP-SM)					
8	SS	18"	M	32	30						
					35						
					40						
					45						

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. DBB-82-01Surface Elevation 895.3Job No. C-10313Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9836, MADISON, WIS. 53718 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		Moisture		Depth	P		W	LL	PL	D	
No.	Type	↓	↓								
9	SS	18"	M	43	50	Dense, Pale Brown (10YR 6/3) Fine to Coarse SAND, Some Gravel, Little Silt (SP-SM)					
					55	End Boring at 50'					
					60						
					65						
					70						
					75						
					80						
					85						

WATER LEVEL OBSERVATIONSWhile Drilling 2.6' (Possible Perched Condition)Upon Completion of Drilling Time After Drilling 1/2 hourDepth to Water 10.8' DMDepth to Cave In **GENERAL NOTES**Start 3/10/82 Complete 3/11/82Crew Chief JWG/SW Rig 55-1Drilling Method CS 0-10'

DM/WO 10-50'

DC(4") 0-10'

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. DBB-82-02Surface Elevation 898.5Job No. C 10313Sheet 1 of 2

1409 EMIL STREET • P.O. BOX 9838, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		Moisture		N	Depth		W	LL	PL	D	
No.	Type	↓	↓								
1	SS	18"	M	11		FILL: Mixture of Silty Clay, Sand & Gravel					
2	SS	18"	M	9	5						
3	SS	18"	M	8		Loose, Dark Yellowish Brown (10YR 3/4) Fine to Coarse SAND, Some Gravel, Some Silt & Clay, Occasional Cobbles (SM)					
4	SS	12"	M	30	10						
5	SS	12"	M	40	15	Medium Dense to Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Coarse SAND, Some Gravel, Trace Silt (SP)					
6	SS	18"	M	24	20						
						Boring Completed to 20' on 3/9/82					
7	SS	18"	M	42	25	Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Coarse SAND, and GRAVEL, Little Silt (SP-SM)					
8	SS	14"	M	18	30						
					35	Medium Dense, Light Yellowish Brown (2.5Y 6/4) Fine SAND, Little Silt & Clay (SP-SM)					
					40						
					45	Very Dense, Pale Brown (10YR 6/3) Fine to Coarse SAND, Little Gravel, Little Silt & Clay, Occasional Cobbles & Boulders (SP-SM)					

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. DBB-82-02Surface Elevation 898.5Job No. C-10313Sheet 2 of 2

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture		Depth		G _s	W	LL	PL	D	
No.	Type	↓	↓	N								
						Very Dense, Pale Brown (10YR 6/3) Fine to Coarse SAND, Little Gravel, Little Silt & Clay, Occasional Cobbles & Boulders (SP-SM)						
9	SS	18"	M	60	50							
						End Boring at 50'						
WATER LEVEL OBSERVATIONS						GENERAL NOTES						
While Drilling _____ NW						Start <u>3/9/82</u> Complete <u>3/10/82</u>						
Upon Completion of Drilling _____						Crew Chief <u>JWG/SW</u> Rig <u>55-1</u>						
Time After Drilling <u>1/2</u> hour _____						Drilling Method <u>CS-Q-10</u>						
Depth to Water <u>10.0' DM</u> _____						FA <u>10-20'</u>						
Depth to Cave In _____						DM/WO <u>20-50'</u> ; DC <u>(4') 0-10'</u>						

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. DBB-82-03Surface Elevation 897Job No. C.10313Sheet 1 of 2

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture				q _s	W	LL	PL	D	
No.	Type	↓	↓	N	Depth							
1	SS	18"	M	11		FILL: Mixture of Silty Clay, Gravel & Asphalt Shingles						
2	SS	18"	M	17	5							
3	SS	18"	M	13			Medium Dense, Pale Yellow (2.5Y 7/4) Fine to Coarse SAND, Trace Silt, Little to Some Gravel (SP)					
4	SS	18"	M	22	10							
5	SS	18"	M	22	15							
6	SS	18"	M	24	20	Medium Dense, Pale Yellow (2.5Y 7/4) Fine SAND, Trace Silt (SP)						
7	SS	18"	M	24	25		Some Silt from 24' to 27' Water Appears to be Perched at 27'					
8	SS	18"	W	24	30	Medium to Stiff, Light Olive Brown (2.5Y 5/4) Clayey SILT, Some Fine Sand (ML)		(1.0)				
					35							
					40							
					45	Dense, Pale Brown (10YR 6/3) Fine to Coarse SAND, Little Silt & Clay, Some Gravel, Occasional Cobbles (SP-SM)	() Pocket Penetrometer Reading, TSF					

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. DBB-82-03Surface Elevation 897.2Job No. C 10313Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9536, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				G _s	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
9	SS	18"	M	39	50	Dense, Pale Brown (10YR 6/3) Fine to Coarse SAND, Little Silt & Clay, Some Gravel, Occasional Cobbles (SP-SM)					
					55	End Boring at 50'					
					60						
					65						
					70						
					75						
					80						
					85						

WATER LEVEL OBSERVATIONS

While Drilling _____

Upon Completion of Drilling _____

Time After Drilling 1/2 hour

Depth to Water 12.0'

Depth to Cave In _____

GENERAL NOTES

Start 2/24/82 Complete 2/24/82

Crew Chief JWG/JS Rig 55-1

Drilling Method CS 0-10'

DM/WO 10-50'

DC (4") 0-10'

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. DBB-82-04Surface Elevation 89Job No. C 10313Sheet 1 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		Moisture		N	Depth		q _s	W	LL	PL	D	
No.	Type	↓	↓									
1	SS	18"	M	3	5	FILL: Mixture of Fine to Coarse Silty Sand, Clay, Cinders & Brick Fragments						
2	SS	12"	M	13								
3	SS	12"	M	31								
4	SS	15"	M	12	10	Medium Dense, Pale Yellow (2.5Y 7/4) Fine to Medium SAND, Trace Silt, Occasional Cobbles (SP)						
5	SS	14"	M	12	15		Seam of Very Silty Sand Encountered at 14'					
6	SS	14"	W	20	20							
7	SS	12"	W	19	25	Trace to Little Coarse Sand & Gravel Encountered at 24'						
8	SS	15"	M	32	30		Dense, Light Yellowish Brown (2.5Y 6/4) Fine SAND, Some Silt & Clay (SM)					
					35							
					40	Very Dense, Pale Brown (10YR 6/3) Fine to Coarse SAND, Some Gravel, Little Silt, Occasional Cobbles (SP-SM)						
					45							

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
 Location Baraboo, Wisconsin

Boring No. DBB-82-04
 Surface Elevation 898.4
 Job No. C.10313
 Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9638, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		Moisture		N	Depth		P	W	LL	PL	D
No.	Type	↓	↓								
9	SS	18"	M	58	50	Very Dense, Pale Brown (10YR 6/3) Fine to Coarse SAND, Some Gravel, Little Silt, Occasional Cobbles (SP-SM)					
						End Boring at 50'					
					55						
					60						
					65						
					70						
					75						
					80						
					85						

WATER LEVEL OBSERVATIONS

While Drilling NW
 Upon Completion of Drilling _____
 Time After Drilling 1/2 hour
 Depth to Water 10.0' DM
 Depth to Cave In _____

GENERAL NOTES

Start 3/9/82 Complete 3/9/82
 Crew Chief JWG/SW Rig 55-1
 Drilling Method CS 0-10'
DM/WO 10-50'
DC(4") 0-10'

FIELD BORING LOG			BORING NO. <u>DBN 89-02</u>	
PROJECT NO.: <u>5733-08</u>	PROJECT NAME: <u>USATHAMA-BAAP</u>		PAGE <u>1</u>	OF <u>1</u>
DRILLING CONTRACTOR: <u>LAYNE-NORTHWEST</u>		DRILLER: <u>G Rodriguez</u>	DATE STARTED <u>2-1-89</u>	COMPLETED <u>2/2/89</u>
METHOD: <u>Dual Well</u>	CASING SIZE: <u>9"</u>	TIP DV: <u>#10</u>	PROTECTION LEVEL: <u>D</u>	
GROUND ELEV.: <u>884.8</u>	SOIL DRILLED: <u>160'</u>	WATER LEVEL: <u>105</u>	TOTAL DEPTH: <u>160</u>	
LOGGED BY: <u>FREDERICK BRANTON</u>		CHECKED BY:	DATE: <u>2-1-89</u>	

BK=0.1

SAMPLE NO.	DEPTH IN FEET	BLUES PER 4-INCHES Time	PEN. REC.	DESCRIPTION fill over top soil over	COMMENTS ON ADVANCE OF BORING Time/10 sec (n/a)	MONITORING	
						TIP	CEL.
S-1	0-10	12:10		Br SAND Gravel	1:39	0.1	
S-2	10-20	1:07		Br med SAND (SP)	1:11	0.1	
S-3	20-30	1:11		Br med SAND w/ some GR SA layers	1:18	0.1	
S-4	30-40	1:20		Br f. to med SA w/ med Co. Gravel layers	1:38	0.1	
S-5	40-50	1:23		SAME (SP)	1:30	0.1	
S-6	50-60	1:26		SAME	0:54	0.1	
S-7	60-70	1:32		Brown med SA w/ + gravel @ 65' (hard) - 66' (SP)	2:30	0.1	
S-8	70-80	1:34		Brown med SAND w/ trace of Gravelly SAND	1:19	0.1	
S-9	80-90	1:39		Brown SA w/ Gravel layers	1:25	0.1	
S-10	90-100	1:43		SAME (SP)	1:15	0.1	
S-11	100-110	1:45		* SAND w/ water line @ SA and layers of CL SILT started (2)	1:19	0.1	
S-12	110-120	1:51		Br SAND & a gravel layers water (maybe CLS) at top. (SP)	2:47	0.0	
S-13	120-130	1:59		GRAV SA & SA GRAV (GP) Gravel @ 121	?	0.0	
S-14	130-140	2:40		SA GRAVEL much water (GP)	2:30	0.0	
S-15	140-150	2:43		SA GRAVEL (GP)	3:24	0.0	
S-16	150-160	2:50		SA fine Gravel (GP)	2:10	0.0	

* CLSILT started at 10' maybe 3-8' thick at max

FIELD BORING LOG

BORING NO. DBN-89-04B

PROJECT NO.: 5753- PROJECT NAME: USATHAMA-BAAP PAGE 1 OF 3
 DRILLING CONTRACTOR: LAYNE-NORTHWEST DRILLER: G. Rodriguez DATE STARTED 7 Feb/89 COMPLETED 7 Feb 89
 METHOD: Hammer CASING SIZE: 9 in. TIP: PROTECTION LEVEL: D
 GROUND ELEV.: 917.7 SOIL DRILLED: 125 ft WATER LEVEL: ~140 ft TOTAL DEPTH: 180 ft 195'
 LOGGED BY: J. Buss CHECKED BY: DATE: 7 Feb/89

SAMPLE NO.	DEPTH IN FEET	BLWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF SCRIPING	MONITORING	
						TIP	REL.
S#1	0-10 ft			Brown silty fine to medium SAND with gravel + cobbles, moist. TILL well rounded cobbles (SP)	Smooth runs	0.9	
S#2	10-20 ft			Brown grading to tan fine to medium SAND w/ occasional gravel (angular) TILL. cobbles + gravel at 20 ft. (SP)		0.1	
S#3	20-30 ft			Brown fine angular gravel with medium to fine SAND. Dry to slightly moist. (SP)		0.1	
S#4	30-40 ft			Brown medium to fine gravel w/ coarse gravel (angular) and fine to medium sand. Dry (SP) Note: the majority of the gravel appears to consist of dolomite + limestone fragments with a little shale, v. little granitic igneous materials.		0.0	
S#5	40-50 ft			Brown medium to fine Sand w/ little fine gravel + occasional cobbles. (SP) dry.		0.1	
S#6	50-60 ft			Brown coarse to med Sand w/ some fine gravel + a little silt (SP)		0.1	

FIELD BORING LOG

BORING NO. DBN-89-04D

PROJECT NO.: 5733-

PROJECT NAME: USATHAMA- BAAP

PAGE 2 OF 3

DRILLING CONTRACTOR: LAYNE-NORTHWEST

DRILLER: G Rodriguez

DATE STARTED 7 Feb 89

COMPLETED 7 Feb 89

METHOD: Hammer

CASING SIZE: 9 in

TIP ON:

PROTECTION LEVEL: D

GROUND ELEV.: 90.3 ft

SOIL DRILLED: 180 ft

WATER LEVEL: ~140 ft

TOTAL DEPTH: 180 ft

LOGGED BY: J. Buss

CHECKED BY:

DATE:

7/ Feb/89

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
						TIP	REL
S# 7	70-80 ft			*sounding on boulder at 73 ft* Brown Coarse to Fine SAND wt some gravel. TILL (SP) dry.		0.4	
S# 8	80-90 ft			Brown Fine to Coarse SAND with cobble zones dry (SP)	air line not working properly slow advance	0.0	
S# 9	90-100 ft			Brown med. to coarse SAND wt some Fine Sand and gravel. dry (SP)		0.0	
S# 10	100-110 ft			Brown Med to Fin SAND wt Little coarse Sand and gravel dry (SP)		0.1	
S# 11	110-120 ft			Brown Fine Sand, trace med Sand and occasional gravel. dry (SP)		0.0	
S# 12	120-130			Brown Fine-Med Sand. trace gravel Dry to slightly moist (SP)		0.0	
S# 13	130-140			Brown Fine-med Sand, wt trace gravel wet at 140 ft	water at 140 ft.	0.0	

FIELD BORING LOG

BORING NO. *DBN-89-04B*

PROJECT NO.: 5753-

PROJECT NAME: USATHANA- BAAP

PAGE 3 OF 3

DRILLING CONTRACTOR: LAYNE-NORTHWEST

DRILLER: *G. Rodriguez*DATE STARTED *7 Feb 8*COMPLETED *7 Feb 8*METHOD: *Hammer*CASING SIZE: *9 in*TIP *W*PROTECTION LEVEL: *D*GROUND ELEV.: *917.7*SOIL DRILLED: *195'*WATER LEVEL: *~140 ft*TOTAL DEPTH: *180 ft 195*LOGGED BY: *Jim Buss*

CHECKED BY:

DATE: *7 Feb 88*

SAMPLE NO.	DEPTH IN FEET	BLWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	CEL
<i>S-14</i>	<i>140-150</i>			<i>Brown Med-Fn Sand wt some gravel and cobbles wet, (SP) No silt</i>			<i>0.1</i>
<i>S-15</i>	<i>150-160</i>			<i>Brown Med-Fine SAND wt Trce gravel, wet (SP) No Silt layers</i>			<i>0.2</i>
<i>S-16</i>	<i>160-166 166 ft</i>			<i>Fine-med Sand occasional Silt lense (SP)</i>	<i>Change @ 160'</i>		<i>0.2</i>
<i>S-17</i>	<i>166-170</i>			<i>silt at 166 ft, brown wt little Sand or clay.</i>	<i>change @ 166'</i>		<i>0.2</i>
<i>S-18</i>	<i>170-180</i>			<i>Fine gravel with some coarse to fine SAND, gravel becomes coarser wt/ depth (GP)</i>	<i>change @ 170'</i>		<i>0.3</i>
	<i>180-195</i>			<i>180-195</i> <i>Feb 9/89 boring extended to 190 ft to accommodate heaving Sands</i> <i>brown Crse-Med SAND wt Gravel</i>			

**ENGINEERING INC**

LOG OF TEST BORING

Project Badger Army Ammunition Plant

Location Baraboo, Wisconsin

Boring No. DBM-82-01

Surface Elevation 917.0

Job No.C.10313.....

Sheet 1 of 4

-1409 EMIL STREET • P.O. BOX 9838, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	Type	Recovery ↓	Moisture ↓	N	Depth		w	LL	PL	D	
						16" TOPSOIL					
1	SS	18"	M	6		Stiff to Very Stiff, Dark Brown (10YR 3/3) Silty CLAY (CL) ST Pushed Hydraulically at 100 PSI	(2.5)				
2	S ^B ST	14"	M	-			(1.5)				
3	SS	18"	M	6		Loose to Dense, Yellowish Brown (10YR 5/4) Fine to Medium SAND, Little Silt & Clay, Some Gravel (SP-SM) More Coarse Sand and Gravel Encountered at 14'					
4	SS	16"	M	26	10						
5	SS	12"	M	40	15						
6	SS	4"	M	30	20	Medium Dense to Dense, Pale Yellow (2.5Y 7/4) Fine to Medium SAND, Trace to Little Silt & Gravel (SP-SM)					
7	SS	12"	M	30	25						
8	SS	18"	M	40	30						
						Boring Completed to 30' on 2/23/82	() Pocket Penetrometer Reading, TSF				
					35	Boring Completed from 30' - 176' on 3/19/82 - 3/22/82 Unit: SAMS-1 Chief: Mark O.					
					40						
					45						

(Continued)

(Continued)



ENGINEERING INC

LOG OF TEST BORING

Project Badger Army Ammunition Plant.....

Location Baraboo, Wisconsin

Boring No. **DBM-82-01**

Surface Elevation ...917.0

Job No. C 10313

Sheet 2 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture				q _w	W	LL	PL	D	
No.	Type	↓	↓	N	Depth							
					50	Lost 80 Gallons of Mud from 0' - 50'						
9	SS	18"	M	82	55		Very Dense, Light Yellowish Brown (10YR 6/4) Fine SAND, Some Silt & Clay (SM)					
					60							
					65	Lost 175 Gallons of Mud from 50' - 80'						
					70							
					75							
10	SS	4"	M	125	80	Very Dense, Light Yellowish Brown (10YR 6/4) Fine to Medium SAND, Little Gravel, Little Silt (SP-SM)						
					85							
					90							

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. DBM-82-01Surface Elevation .917Job No. C. 10313Sheet 3 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture				q _s	W	LL	PL	D	
No.	Type	↓	↓	N	Depth							
11	SS	3"	M	119	95	<p>Very Dense, Light Yellowish Brown (10YR 6/4) Fine to Medium SAND, Little Silt, Little Gravel (SP-SM)</p> <p>Lost 175 Gallons of Mud from 80' - 120'</p>						
					100							
					105							
					110							
					115							
					120							
					125							
12	SS	6"	M	125	30		<p>Very Dense, Light Yellowish Brown (10YR 6/4) Fine to Medium SAND, Little Silt, Trace Gravel (SP-SM)</p>					
					35		<p>Boring Completed to 130' on 3/20/82</p>					

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Location Baraboo, Wisconsin

Boring No. DBM-82-01
Surface Elevation 917.0
Job No. C 10313
Sheet 4 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture		Depth		q _v	W	LL	PL	D
No.	Type	↓	↓	N							
					140	Hard, Yellowish Brown (10YR 5/4) Silty CLAY, Trace Sand (CL)					
					145						
					150						
					155						
13	SS	18"	M	147	155		4.5+				
					160						
					165						
					170						
					175						
					175						
					175	Very Dense, Yellowish Brown (10YR 5/4) Fine to Coarse SAND, Little Gravel, Trace Silt (SP)					
					175						

Hard, Yellowish Brown (10YR 5/4)
Silty CLAY, Trace Sand (CL)

Boring Extended an Additional
20' to get Below Clay Stratum

Very Dense, Yellowish Brown
(10YR 5/4) Fine to Coarse
SAND, Little Gravel, Trace
Silt (SP)

4.5+

() Pocket Penetrometer
Reading, TSF

UNDER LEVEL OBSERVATIONS**End Boring at 176'****GENERAL NOTES**

Start 2/23/82 Complete 3/22/82
Crew Chief JWG/JS Rig 55-1
Drilling Method CS 0-10'
FA 10-30'; DM/WO 30-176'

While Drilling _____
Upon Completion of Drilling _____
Time After Drilling 1/2 hour _____
Depth to Water _____
Depth to Cave In 25.0' Moist

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. DBM-82-02Surface Elevation 918.2Job No. C.10313Sheet 1 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4648

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		Moisture		N	Depth		P _s	W	LL	PL	D	
No.	Type	↓	↓									
1	SS	18"	M	16	*	7" TOPSOIL Stiff, Dark Brown (10YR 3/3) Silty CLAY (CL)	(1.5)					
2	3" ST	16"	M	-	5	***						
						**		42.4	20.2			
3	SS	18"	M	22		Medium Dense to Dense, Light Olive Brown (2.5Y 5/4) Fine to Coarse SAND and GRAVEL, Little Silt & Clay (SP-SM)						
4	SS	7"	M	42	10							
5	SS	12"	M	65	15	Medium Dense to Very Dense, Light Olive Brown (2.5Y 5/4) Fine to Coarse SAND, Some Silt & Clay, Some Gravel (SM)						
6	SS	18"	M	26	20							
7	SS	9"	M	38	25							
8	SS	12"	M	38	30	Boring Completed to 30' on 2/24/82						
					35	* 2' of Frost Present						
						** Light Yellowish Brown (2.5Y 6/4) Fine to Medium SAND, Trace Silt & Gravel (SP)						
					40	*** Shelby Tube Hydraulically Pushed at 600 PSI	()					
					45							

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project **Badger Army Ammunition Plant**Location **Baraboo, Wisconsin**Boring No. **DBM-82-02**Surface Elevation **918.2**Job No. **C 10313**Sheet **2** of **4**

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		Moisture		N	Depth		q _u	W	LL	PL	D	
No.	Type	↓	↓									
					50	Boring Completed from 30' - 155.5' on 3/19/82 Unit: SAMS-2 Chief: Tom O. Very Dense, Light Yellowish Brown (10YR 6/4) Fine to Coarse SAND, Some Gravel, Little Silt & Clay (SW-SM)						
9	SS	18"	M	95	55							
					60							
					65							
					70							
					75							
10	SS	18"	M	79	80		Very Dense, Pale Yellow (2.5Y 7/4) Fine to Medium SAND, Trace Gravel, Trace Silt (SP)					
					85							
					90							

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. DBM-82-02Surface Elevation 918Job No. C-10313Sheet 3 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				Q _u	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
11	SS	18"	M	145	95	Very Dense, Pale Yellow (2.5Y 7/4) Fine to Medium SAND, Trace Gravel, Trace Silt (SP)					
					100						
					105						
					110						
					115						
					120	Very Dense, Pale Yellow (2.5Y 7/4) Fine to Medium SAND, Trace Silt (SP)					
					125						
					130						
					135						
					140						

seal

(Continued)



ENGINEERING INC

LOG OF TEST BORING

Project .. Badger Army Ammunition Plant..

Location Baraboo, Wisconsin

Boring No. DBM-82-02

Surface Elevation 918.2

Job No. C 10313

Sheet 4 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				q _u	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
					140	Hard, Yellowish Brown (10YR 5/4) Stratified Silty CLAY and Fine SAND (CL/SM)					
					145						
					150						
13	SS	-	M	-			(4.5+)				
14	SS	18"	W	139	155						
					160	End Boring at 155.5'					
					165	No Mud Loss During the Drilling Operation					
					170						
					175						
							() Pocket Penetrometer Reading, TSF				

WATER LEVEL OBSERVATIONS

While Drilling _____

Upon Completion of Drilling _____

Time After Drilling 1/2 hour

Depth to Water _____

Depth to Cave In 27 MO1st

GENERAL NOTES

Start 2/24/82 Complete 3/19/82

Crew Chief JWG/JS Rig 55-1

Drilling Method CS 0-10

FA 10-30'

DM/WO 30-155.5'

**ENGINEERING INC**

LOG OF TEST BORING

Project Badger Army Ammunition Plant

Location Baraboo, Wisconsin

Boring No. DBN-82-01B

Surface Elevation 905

Job No. C 10313

Sheet1..... of1.....

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				q _v	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
						<p>NOTE: For more detailed subsurface information, refer to Log of Test Boring No. S-1122</p> <p>800 Gallons of Drilling Mud Loss from 15' - 20'</p> <p>Drilling from 45' - 157' performed on 3/23/82</p> <p>End Boring at 157'</p>					
WATER LEVEL OBSERVATIONS						GENERAL NOTES					
While Drilling _____						Start <u>3/22/82</u> Complete <u>3/23/82</u>					
Upon Completion of Drilling _____						TO _____ RIG _____					
Time After Drilling _____						Crew Chief _____ Rig _____					
Depth to Water _____						Drilling Method <u>DM 0-157'</u>					
Depth to Cave In _____						_____					

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. DBN-82-01CSurface Elevation 905.0Job No. C 10313Sheet 1 of 1

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		Moisture		N	Depth		q _s	W	LL	PL	D
No.	Type	↓	↓								
						NOTE: For more detailed subsurface information, refer to Log of Test Boring No. S-1122 Drilling from 75' - 167' performed on 3/22/82					
						End Boring at 167'					
WATER LEVEL OBSERVATIONS While Drilling _____ Upon Completion of Drilling _____ Time After Drilling _____ Depth to Water _____ Depth to Cave In _____						GENERAL NOTES 3/20/82 3/22/82 Start _____ Complete _____ Crew Chief <u>TO</u> Rig <u>SAMS-2</u> Drilling Method <u>DM 0-167'</u>					

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant

Location Baraboo, Wisconsin

Boring No. ELB-82-01

Surface Elevation 899.2

Job No. C.10313

Sheet 1 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture		Depth		G _s	W	LL	PL	D
No.	Type	↓	↓	N							
1	SS	18"	M	7	7	Stiff to Very Stiff, Dark Yellowish Brown (10YR 4/4) Silty CLAY (CL) ST Pushed Hydraulically from 3-5'	2.0)				
2	B"ST	24"	M	2	2		1.3)		26.9	19.8	
3	SS	12"	M	10	10	Loose to Medium Dense, Dark Yellowish Brown (10YR 4/6) Fine to Coarse GRAVEL and SAND, Little Silt, Occasional Cobbles (GW-GM) *					
4	SS	16"	M	18	18						
5	SS	15"	M	20	15	Medium Dense, Yellowish Brown (10YR 5/4) Sandy SILT (ML) Medium Dense, Yellowish Brown (10YR 5/4) Fine to Medium SAND, Little Silt & Clay (SP-SM)					
6	SS	18"	M	20	20						
7	SS	18"	M	16	25	Medium Dense, Pale Yellow (2.5Y 7/4) Fine to Medium SAND, Some Silt & Clay (SM) * Greater Percentage of Sand than Gravel noted at 9'					
8	SS	15"	M	27	30						
					35	Occasional Gravel and Cobbles Encountered at 43'					
					40						
					45						

() Pocket Penetrometer Reading, TSF

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. ELB-82-01Surface Elevation 899.2Job No. C 10313Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9636, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		Moisture		N	Depth		P	W	LL	PL	D
No.	Type	↓	↓								
						Medium Dense, Pale Yellow (2.5Y 7/4) Fine to Medium SAND, Some Silt & Clay (SM)					
9	SS	18"	M	22	50	**	(1.5)				
						End Boring at 50'					
					55						
					60						
					65	** Stiff, Light Yellowish Brown (10YR 6/4) Silty CLAY, Trace Fine Sand (CL)	() Pocket Penetrometer Reading T\$F				
					70						
					75						
					80						
					85						

WATER LEVEL OBSERVATIONS						GENERAL NOTES	
While Drilling <u>NW</u>						Start <u>3/12/82</u> Complete <u>3/12/82</u>	
Upon Completion of Drilling <u>---</u>						Crew Chief <u>JWG/SW</u> Rig <u>55-1</u>	
Time After Drilling <u>1/2 hour</u>						Drilling Method <u>CS 0-10'</u>	
Depth to Water <u>8.0' DM</u>						DM/WO <u>10-50'</u>	
Depth to Cave In <u>---</u>						DC (4") <u>0-10'</u>	



ENGINEERING INC

LOG OF TEST BORING

Badger Army Ammunition Plant

Location Baraboo, Wisconsin

Boring No. ELB-82-02

Surface Elevation 90

Job No. C 10313

Sheet of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture				q _c	W	LL	PL	D	
No.	Type	↓	↓	N	Depth							
1	SS	18"	M	10		Stiff, Dark Yellowish Brown (10YR 4/4) Silty CLAY (CL)	(1.5)					
2	3"ST	16"	M	-	5	Shelby Tube Pushed Hydraulically from 3-5'	(1.5)					
3	SS	9"	M	15		Medium Dense, Yellowish Brown (10YR 5/6) Fine to Coarse SAND, Some Gravel, Little Silt, Occasional Cobbles (SP-SM) Color Change to Light Olive Brown (2.5Y 5/4) at 9'						
4	SS	12"	M	21	10							
5	SS	18"	M	28	15							
6	SS	18"	M	13	20	Medium Dense, Very Pale Brown (10YR 7/4) Fine SAND, Little Silt (SP-SM)						
7	SS	18"	M	26	25	Medium Dense, Light Olive Brown (2.5Y 5/4) Fine to Coarse SAND, Gravel, Trace Silt						
8	SS	18"	M	27	30	Medium Dense, Light Olive Brown (2.5Y 5/4) Sandy SILT (ML)						
					35	Very Fine to Fine SAND, Trace Silt (SP)						
					40							
					45							
							() Pocket Penetrometer Reading, TSF					

(Continued)

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
 Location Baraboo, Wisconsin

Boring No. ELB-82-02
 Surface Elevation 902.8
 Job No. C 10313
 Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9836, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		Moisture		N	Depth		#	W	LL	PL	C
No.	Type	↓	↓								
						Very Fine to Fine SAND, trace Silt (SP)					
9	SS	7"	M	80	50	*					
						End Boring at 50'					
					55	* Very Dense, Light Olive Brown (2.5Y 5/4) Fine to Medium SAND, Some Silt & Clay, Little to Some Gravel, Occasional Cobbles (SM)					
					60						
					65						
					70						
					75						
					80						
					85						
WATER LEVEL OBSERVATIONS						GENERAL NOTES					
While Drilling <u>NW</u>						Start <u>3/15/82</u> Complete <u>3/15/82</u>					
Upon Completion of Drilling <u>1/4</u> hour--						Crew Chief <u>JWG/SW</u> Rig <u>55-1</u>					
Time After Drilling _____						Drilling Method <u>CS 0-10'</u>					
Depth to Water <u>13.0' DM</u>						DM/WO <u>10-50'</u>					
Depth to Cave In _____						DC (#") <u>0-10'</u>					

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. ELB-82-03Surface Elevation 910.4Job No. C 10313Sheet 1 of 2

1409 EMIL STREET • P.O. BOX 9536, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture		Depth		P	W	LL	PL	D	
No.	Type	↓	↓	N								
1	SS	18"	M	11		Stiff to Very Stiff, Dark Yellowish Brown (10YR 4/4) Silty CLAY (CL) *	(2.0)					
2	3"ST	18"	M	-	5							
3	SS	18"	M	41		Dense, Pale Yellow (2.5Y 7/4) Fine to Medium SAND, Little Silt, Occasional Cobbles (SP-SM)						
4	SS	12"	M	40	10							
5	SS	12"	M	80	15	Very Dense, Pale Yellow (2.5Y 7/4) Fine to Coarse GRAVEL and SAND, Little Silt (GP-GM)						
6	SS	18"	M	14	20							
7	SS	18"	M	32	25	Medium Dense to Dense, Pale Yellow (2.5Y 7/4) Fine SAND, Trace to Little Silt (SP-SM) Some Medium Sand & Gravel Encountered at 25'						
8	SS	18"	M	27	30							
					35	Medium Dense, Pale Yellow (2.5Y 7/4) Fine SAND, Some Silt & Clay (SM) * Shelby Tube Pushed Hydraulically from 3' to 5' at 1000 PSI						
					40							
					45							

() Pocket Peretrometer Reading, TSF

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
 Location Baraboo, Wisconsin

Boring No. ELB-82-03
 Surface Elevation 910.4
 Job No. C 10313
 Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9838, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		Moisture		N	Depth		* W	LL	PL	D	
No.	Type	↓	↓								
9	SS	18"	M	17	50	Medium Dense, Pale Yellow (2.5Y 7/4) Fine SAND, Some Silt & Clay (SM)					
					55	End Boring at 50'					
					60						
					65						
					70						
					75						
					80						
					85						

WATER LEVEL OBSERVATIONS					GENERAL NOTES	
While Drilling	NW				Start	3/11/82 Complete 3/11/82
Upon Completion of Drilling					Crew Chief	WG/SW Rig 55-1
Time After Drilling	1/2 hour				Drilling Method	CS 0-10'
Depth to Water	13.0' DM				DM/WD	10-50'
Depth to Cave In					DC (4")	0-10'

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. ELB-82-04Surface Elevation 906.6Job No. C.10313Sheet 1 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				P	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
1	SS	27"	M	26		FILL: Silty Clay					
						12" TOPSOIL					
2	SS	30"	M	6	5	Stiff to Very Stiff, Dark Brown (10YR 3/3) Silty CLAY (CL)	(2.2)				
3	3"ST	9"	M	--	5	ST Pushed Hydraulically at 600 PSI	(1.4)				
4	SS	24"	M	15	10	Medium Dense, Yellowish Brown (10YR 5/6) Fine to Coarse SAND & GRAVEL, Some Silt & Clay (SM)					
5	SS	18"	W	39	15	Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Coarse GRAVEL, Little Silt, Some Fine to Coarse Sand, Occasional Cobbles (GW-GM)					
6	SS	18"	W	34	20						
7	SS	18"	W	20	25	Medium Dense, Light Yellowish Brown (2.5Y 6/4) Silty Fine SAND, Little to Some Clay (SM)					
8	SS	18"	W	17	30	Medium Dense, Light Olive Brown (2.5Y 5/4) Fine to Medium SAND, Trace Silt (SP)					
					35						
					40						
					45	Medium Dense, Light Yellowish Brown (2.5Y 6/4) Silty Fine SAND, Little to Some Clay (SM)					

() Pocket Penetrometer Reading, TSF

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. ELB-82-04Surface Elevation 906.6Job No. C-10313Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture				G	W	LL	PL	D	
No.	Type	↓	↓	N	Depth							
						Medium Dense, Light Yellowish Brown (2.5Y 6/4) Silty Fine SAND, Little to Some Clay (SM)						
9	SS	17"	W	26	50							
						End Boring at 50'						
WATER LEVEL OBSERVATIONS						GENERAL NOTES						
While Drilling _____						2/23/82 2/23/82						
Upon Completion of Drilling _____						Start _____ Complete _____						
Time After Drilling $\frac{1}{4}$ hour _____						Crew Chief L.S. Rig 55-2...						
Depth to Water 6.0' DM _____						Drilling Method CS 0-10'						
Depth to Cave In _____						DM/WO 10-50'						
						DC(4") 0-10'						

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. ELB-82-Surface Elevation 919.6Job No. C 10313Sheet 1 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				G	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
1	SS	24"	M	90		FILL: Silty Fine to Medium Sand, Occasional Gravel					
2	SS	30"	M	4	5	FILL: Mixture of Silty Sand, Cinders, Paper, Wood & Asphalt Shingles					
3	SS	25"	M	12							
4	SS	30"	M	14	10						
5	SS	18"	W	58	15	Very Dense, Yellowish Brown (10YR 5/4) Fine to Coarse SAND, Some Silt & Clay, Some Gravel, Occasional Cobbles (SM)					
6	SS	18"	W	24	20	Medium Dense to Dense, Pale Yellow (2.5Y 7/4) Fine SAND, Trace to Little Silt (SP-SM) 2" Seam of Coarse Sand & Gravel Encountered at 25'					
7	SS	18"	W	32	25						
8	SS	18"	W	26	30						
					35						
					40						
					45						

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. ELB-82-05Surface Elevation 919.6Job No. C.10313Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9838, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				P	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
						Medium Dense to Dense, Pale Yellow (2.5Y 7/4) Fine SAND, Trace to Little Silt (SP-SM)					
9	SS	18"	W	12	50	End Boring at 50'					
					55						
					60						
					65						
					70						
					75						
					80						
					85						

WATER LEVEL OBSERVATIONS						GENERAL NOTES	
While Drilling						Start	2/23/82
Upon Completion of Drilling						Complete	2/23/82
Time After Drilling	1/2 hour					Crew Chief	LS 55-2
Depth to Water	6.0' DM					Drilling Method	CS 0-10'
Depth to Cave In						DM/WO	10-50'
						DC(4")	0-10'

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project: Badger Army Ammunition PlantLocation: Baraboo, WisconsinBoring No. ELB-82-06Surface Elevation 922Job No. C. 10313Sheet 1 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		Moisture		N	Depth		G _s	W	LL	PL	D
No.	Type	↓	↓								
1	SS	15"	M	11		FILL: Fine to Coarse Silty Sand and Gravel					
2	SS	18"	M	8	5						
3	3" ST	12"	M	-	<input checked="" type="checkbox"/>	Stiff, Dark Yellowish Brown (10YR 4/4) Silty CLAY (CL)	(1.8)				
4	SS	18"	M	19	10	Medium Dense, Dark Yellowish Brown (10YR 4/4) Fine to Coarse GRAVEL and SAND, Little Silt (GP-GM)					
5	SS	5"	M	14	15						
6	SS	12"	M	17	20	Medium Dense to Dense, Light Yellowish Brown (10YR 6/4) Fine SAND, Little Silt (SP-SM) Occasional Cobbles Encountered at 16' Some Silt & Clay Present at 24'					
7	SS	17"	M	29	25						
8	SS	17"	M	25	30						
					35						
					40						
					45						

() Pocket Penetrometer Reading, TSF

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
 Location Baraboo, Wisconsin

Boring No. ELB-82-06
 Surface Elevation 922.7
 Job No. C 10313
 Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9536, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture		Depth		Gr	W	LL	PL	D
No.	Type	↓	↓	N							
9	SS	12"	M	30	50	Medium Dense to Dense, Light Yellowish Brown (10YR 6/4) Fine SAND, Little Silt (SP-SM) Trace Silt Present at 49'					
					55	End Boring at 50'					
					60						
					65						
					70						
					75						
					80						
					85						
WATER LEVEL OBSERVATIONS						GENERAL NOTES					
While Drilling <u>NW</u>						Start <u>3/17/82</u> Complete <u>3/17/82</u>					
Upon Completion of Drilling _____						Crew Chief <u>JWG/JS</u> Rig <u>55-1</u>					
Time After Drilling <u>1/2</u> hour						Drilling Method <u>CS 0-10'</u>					
Depth to Water <u>13.6' DM</u>						<u>DM/VO 10-50'</u>					
Depth to Cave In _____						<u>DC(4") 0-10'</u>					

FIELD BORING LOG				Boring No. ELN-91	
Project: No 06353-03		Project: Name BADGER AAP		Page 1 of 2	
Contractor LAYNE		Driller G. RODRIGUEZ		Date started 11-10-91 completed 11-10-91	
Method VIAL WALL		Casing Size 9" O.D.		MNU 11.7110.2	
Ground EL		Soil Drilled 130'		7' below ground 118'	
Protection Level D		Total Depth 130'			
Logged by RRR		Checked by DRP		Date 11/20/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen rec	Description	Comments on Advance of Boring	Monitoring	
						MNU	LEL
SEE ELN-91-01	0-10'			DR BROWN - RED CLAYEY SILT, TR F SAND, TR C GRAVEL TR COBBLES COHESIVE	(ML)		
	10-20'			LT BROWN SILTY SAND, WGD, F, SOME M, LITTLE C, TR F GRAVEL, TRACE CLAY PELLETS, COHESIVE	(SW)		
	20-30'			LT BROWN SAND, WGD, M, SOME F, LITTLE SILT LITTLE C, TR GRAV, TR COBBLES	(SW)		
	30-40'	30-32 32-40		SAME AS ABOVE COBBLE AND BOULDER ZONE			
	40-50	40-42 42-50		COBBLE AND BOULDER ZONE LT BROWN SAND, FGD M, SOME C, LITTLE F, TR F GRAV, TR C GRAV	(SP)		
	50-60			LT BROWN SAND, WGD, M-C SOME F GRAV, SOME F SAND TR COBBLES	(SW)		
	60-70	70-72 72-80		SAME AS ABOVE LT BROWN SANDY GRAVEL, WGD, GRAV: F, LITTLE C, TR COBBLES, SAND: M-C	(GW)		
	70-80			SAME AS ABOVE	(GW)		
	80-100			SAME AS ABOVE	(GW)		
	100-106	100-101 101-106		SAME AS ABOVE ORANGE-RED SAND, WGD C, SOME M, SOME F GRAV TR COBBLES	(SW)		
SPON #1	106-108	7/11/25/40	2/1.5	LT BROWN SAND, WGD, C, SOME M, LITTLE F GRAV, TR C GRAV	(SW)		

FIELD BORING LOG				Boring No. <u>EW-91-074</u>	
Project: No <u>0685J-OJ</u>		Project: Name <u>BADGER AAP</u>		Page <u>2</u> of <u>2</u>	
Contractor <u>LAYNE</u>		Driller <u>G. RODRIGUEZ</u>		Date started <u>11-10-91</u> completed <u>11-10-91</u>	
Method <u>DUAL WALL</u>		Casing Size <u>9" O.D.</u>		HNU <u>11.7/10.2</u> Protection Level <u>D</u>	
Ground EL		Soil Drilled <u>/30'</u>		<u>2'</u> below ground <u>/18'</u> Total Depth <u>/30'</u>	
Logged by <u>TRC</u>		Checked by <u>DRP</u>		Date <u>11/20/91</u>	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
SPoon # 2	108-110'	12/25/35	3/0	NO RECOVERY CYCLONE CUTTINGS = F GRAVEL LT BROWN	(GW)	TAR AIR	0
SPoon # 3	110-112	22/33/38/47	2/1.3	LT BROWN GRAVELLY SAND, WGD, SAND: M-C, LITTLE F, GRAVEL: F, LITTLE C, TR COBBLES	(SW)		0
SPoon # 4	112-114	6/19/36/36	2/1.4	LT BROWN SAND, WGD, C. SOME M, LITTLE-SOME F GRAV LITTLE F SAND	(SW)		0
SPoon # 5	114-116	11/50+5	1/1	LT BROWN SAND, FGD, M, SAND C, TR F GRAVEL	(SP)		0
SPoon # 6	115-117	17/50+0.2	0.3/1.5	LT BROWN SAND, WGD, M-C, LITTLE F GRAVEL, LITTLE C GRAVEL LITTLE F SAND	(SW)		0
SPoon # 7	REFUSAL AT 116' BGS						
115-120				LT BROWN SAND AND GRAVEL, C SAND, F GRAVEL WGD	(SW) (RE) 118'		0
120-130				LT BROWN GRAVELLY SAND, WGD, M-C, GRAVEL: F, SOME C B.O.E = 130'	(SW)		0

FIELD BORING LOG				Boring No. EW-91-01	
Project NO 06853-03		Project Name RANXTR AAP		Page 1 of 2	
Contractor LAYNE		Driller G RODRIGUEZ		Date started 11-9-91 completed 11-9-91	
Method DUAL WAY		Casing Size 9" O.D.	HNU 11.7/10.2	Protection Level D	
Ground El		Soil Drilled 150'	± below ground 115'	Total Depth 150'	
Logged by RRR		Checked by DRP		Date 11/11/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-1	0-10'			Δ BROWN - RED BROWN CLAYEY SILT, TR F SAND TR M SAND, COHESIVE, MOIST.	(ML)	JAR	AIR
S-2	10-20'	10-18'		LT BROWN - RED SILTY SAND AND SILT, WGD, SAND: F-M, TR CLAY PELLETS, TR - LITTLE COBBLES	(SM)		
		18-20'		LT BROWN SAND, WGD, M-C, SOME F SAND, TR GRAV	(SW)		
S-3	20-30'			BOULDER AND COBBLE ZONE w/ LT BROWN SAND WGD, M-C	BIT IS PICKING UP OTBITE BOULDERS AND PUSHING THEM AHEAD BLOCKING THE BIT OPENING		
S-4	30-40'			SAME AS ABOVE	"		
S-5	40-50'			SAME AS ABOVE	"		
S-6	50-60'	50-55 55-60		SAME AS ABOVE LT BROWN SAND, WGD, M-C SOME F GRAV. LITTLE C GRAV. TR COBBLES	Dislodge Rock at 55' (SW)		
S-7	60-70'			SAME AS 55-60'	SW		
S-8	70-80'			LT BROWN SANDY GRAVEL CHANGING INTO GRAVELY SAND, WGD, SAND = M-C TR F SAND, GRAVEL: F, SOME C SAND GRAV. TR COBBLES			

FIELD BORING LOG				Boring No. EW-9-078	
Project NO 06853-03		Project Name BANGER AAP		Page 2 of 2	
Contractor LAYNE		Driller G. RODRIGUEZ		Date started 11-9-91 completed 11-9-91	
Method DUAL WALL		Casing Size 9" O.D.		HNU 11.7/10.2	
Ground EL		Soil Drilled 150'		Protection Level D	
		2' below ground 115'		Total Depth 150'	
Logged by RRC		Checked by DRP		Date 11/11/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-9	80-90'	80-84'		LT BROWN SAND, WGD, C SOME M, SOME F GRAV, LITTLE C GRAV.	(SW)	JAR	0
		84-90'		GREY-BLACK GRAVEL, PGD, C GRAVEL, SOME F GRAVEL, LITTLE C SAND, LITTLE COBBLES	(GP)	0	0
S-10	90-100	90-97'		GRAVEL AND SANDY GRAVEL AS ABOVE SAND: M-C	(GP)	0	0
		97-100'		GRAVELY SAND, WGD, SAND: M-C, LITTLE F SAND GRAVEL: F, SOME C, TR COBBLES	(SW)	0	0
S-11	100-110	100-106		LT BROWN SAND, WGD, C, SOME M, SOME F GRAV, LITTLE F SAND, TR C GRAV	(SW)	0	0
		106-110		LT BROWN GRAVEL, WGD, C GRAVEL, SOME F GRAVEL, SOME C SAND.	(GW)	0	0
S-12	110-120	110-117		LT BROWN SANDY GRAVEL, WGD, AS ABOVE 106-110	(GW)	0	0
		117-120		LT BROWN SAND, WGD, C, SOME M, LITTLE-SOME F GRAV	115'	0	0
S-13	120-130			LT BROWN SANDY GRAVEL, WGD, GRAV: F, LITTLE C SAND: M-C, LITTLE F SAND LITTLE SILT	(GW)	0	0
S-14	130-140			SAME AS S-13	(GW)	0	0
S-15	140-150			LT BROWN SAND, WGD, C, SOME M, SOME F GRAV	WATER TURNED DARK BROWN AT 147' (SW)	0	0
				BOE. = 150' BGS			

FIELD BORING LOG				Boring No. ELM-9	
Project No. 06853-03		Project Name BADGER AAP		Page 1 of 3	
Contractor LAYNE		Driller G. ZORRIVER		Date started 11-13-91 completed 11-13-91	
Method DUAL WALL		Casing Size 9" O.D.		HNU 11.7/10.2	
Ground El.		Soil Drilled 155'		7' below ground 141'	
Logged by KRRC		Checked by DRP		Date 11/20/91	
				Protection Level D	
				Total Depth 155'	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		
						HNU	LEL	
S-1	0-10'	0-7'		LT BR CLAYEY SILT, LITTLE F SAND, TR C SAND, COHESIVE.	(ML)	JAR	ATR	
		7-10'		LT BROWN GRAVELY SAND, WGD, C, SOME M, GRAV-F, TR COBBLES, LITTLE SILT	(SW)			
S-2	10-20	10-15'		SAME AS 7-10' w/ OCCASIONAL COBBLE ZONES				
		15-20'		LT BROWN SAND, WGD, C, SOME M, LITTLE-SOME F, GRAV, LITTLE F SAND, LITTLE SILT.	(SW)			
S-3	20-30'	20-24'		SAME AS 15-20'				
		24-30'		LT BR SAND, P-D, F, LITTLE M, LITTLE-SOME SILT, TR C SAND TR GRAV.	(SP)			
S-4	30-40			SAME AS 24-30'	(SP)			
S-5	40-50			SAME AS 24-30'	(SP)			
S-6	50-60			LT BROWN SAND, P-D, F-M, LITTLE SILT, LITTLE C SAND, TR F GRAV	(SP)			
S-7	60-70'			LT BROWN SAND, P-D, CHANGING TO WGD w/ DEPTH, M, SOME C, SOME F, LITTLE F GRAVEL, TR C GRAVEL, TR SILT	(SP)			
				AT 70' ENCOUNTER A COBBLE ZONE IN A F SAND AND SILT MATRIX	(SW)			

FIELD BORING LOG				Boring No. <u>ELM-91-10</u>	
Project No. <u>06853-03</u>		Project Name <u>RANGER AAP</u>		Page <u>2</u> of <u>3</u>	
Contractor <u>LAYNE</u>		Driller <u>G. BOONE</u>		Date started <u>11-13-91</u> completed <u>11-13-91</u>	
Method <u>WALWALL</u>		Casing Size <u>9" O.D.</u>	MNU <u>11.7110.2</u>	Protection Level <u>D</u>	
Ground El		Soil Drilled <u>155'</u>	<u>2</u> below ground <u>141'</u>	Total Depth <u>155'</u>	
Logged by <u>RRR</u>		Checked by <u>DRP</u>		Date <u>11/20/91</u>	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring MNU LEL		
S-8	70-80	70-74'		COBBLE AND GRAVEL ZONE	(GW)	JAR	AIR	
		74-76'		BROWN GRAVEL, WGD, F				
				SOME C, SOME COBBLES				
		76-79'		LT BROWN SAND, WGD, M,				
S-9	80-90			SOME C, SOME F GRAVEL,	(SW)			
				LITTLE C GRAVEL				
S-10	90-100'			COBBLE AND BOULDER ZONE	(GP)			
				W/ C GRAVEL				
S-11	100-110			LT BROWN-RED SILTY SAND, WGD, F, SOME M,	(SW)			
				TR LITTLE F GRAVEL, TR COBBLES				
S-12	110-130			LT BROWN GRAVELY SAND, WGD, M-C, LITTLE F, GRAV=	(SW)			
				F, LITTLE C				
S-12	130-133'			SAME AS ABOVE	(SW)			
				NO SAMPLE TAKEN				
SPON #1	133-134.8	9/22/41/50	1.2/1.7	LT BROWN SAND, PD, C, SOME M, LITTLE F GRAVEL, TR C GRAVEL.	(SP) ✓ 10:50			
SPON #2	135-137	7/19/29/40	20/1.7	SAME AS SPON #1, DAMP	(SP)			
SPON #3	137-139	3/5/16/29	20/1.5	SAME AS SPON #1	(SP)			

FIELD BORING LOG				Boring No. <u>ELM-9</u>	
Project No. <u>06853-031</u>		Project Name <u>BANGER AAP</u>		Page <u>3</u> of <u>3</u>	
Contractor <u>LAYNE</u>		Driller <u>G. KOONWITZ</u>		Date started <u>11-13-91</u> completed <u>11-13-91</u>	
Method <u>SWALL WALL</u>		Casing Size <u>9" O.D.</u>		HNU <u>11.7/10.2</u> Protection Level <u>D</u>	
Ground El		Soil Drilled <u>155'</u>		<u>2</u> below ground <u>141'</u> Total Depth <u>155'</u>	
Logged by		Checked by <u>DRP</u>		Date <u>11/20/91</u>	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		
						HNU	LEL	
SPoon #4	139-141	17/21/33/54	2.0 0.6	-LT BROWN SAND, WGD, C, SOME M, LITTLE C GRAVEL	ROCK STUCK IN SHOULDER (SW)	0	0	0
SPoon #5	141-142.2	9/15/24/35	2.0 1.2	AS ABOVE, WET - 141-141.5	141'	0	0	0
	141.5-142.2			LT BR SAND, P.D., C	(SP)			
SPoon #6	143-144.3	2/6/10/16	2.0 1.3	LT BR SAND, P.D., C	(SP)	0	0	0
SPoon #7	145-146.4	4/6/7/12	2.0 1.4	SAME AS ABOVE	(SP)	0	0	0
SPoon #8	147-149	3/4/6/17	2.0 2.0	LT BR SAND, P.D., M-C, LITTLE F	(SP)	0	0	0
SPoon #9	149-150.8	5/10/16/33	2.0 1.8	LT BROWN SAND, P.D. FINING DOWNWARD. M → F 0.1' THICK LENS OF SILT AT 150.6'	(SP)	0	0	0
SPoon #10	151-153	5/16/15/24	2.0 2.0	LT BROWN SAND, P.D., F, SOME - LITTLE SILT, LITTLE M, TR C.	(SP)	0	0	0
SPoon #11	153-155	5/10/23/44	2.0 2.0	153-154.6 - SAME AS ABOVE 154.6-155: LT BROWN CLAYEY SILT, TR F SAND, COHESIVE, FIRM	(SP) (ML)	0	0	0

FIELD BORING LOG

BORING NO. ^NELM-89-02A

PROJECT NO.: 5753-CB

PROJECT NAME: USATHAMA-BAAP

PAGE 1

OF 2

DRILLING CONTRACTOR: LAYNE-NORTHWEST

DRILLER: G. Rodriguez

DATE STARTED 1/24/89

COMPLETED 1/24/89

METHOD: Dual Well

CASING SIZE: 9.0" O.D. / 6.75" I.D.

TIP W: 10.6

PROTECTION LEVEL: 0

GROUND ELEV.: NA

SOIL DRILLED: 140'

WATER LEVEL: 138'

TOTAL DEPTH: 140'

LOGGED BY: SNW

CHECKED BY:

DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TOP	LEL
S-1	0-10'			0-5 - med to coarse sand tan w/ little x-lv gravel Brown (fine) 5-10 Brown silty fine sand w/ some med-lv gravel cobbles	Change @ 5' Gravel seam @ 7-8'		
S-2	10-20'			Brown f-m sand w/ tr. c-sand Some sub rounded to rounded gravel	(SP)		
S-3	20-30'			Brown f-m sand w/ tan little gravel (sm-med) sub rounded to rounded grading to w/ depth a f-sand w/ tr. med sand tr. gravel	(SP)		
S-4	30-40'			Brown f-c sand w/ sub x to sub rounded sm to lg gravel gravel seam @ 37-39'	(SP)		
S-5	40-50			SAME as above fining w/ depth	(SP)		
S-6	50-60			Tan f-m sand w/ tr. c-sand tr. gravel sm rounded	(SP)		
S-7	60-70			SAME as above Silt lens @ ~ 64' - brown dry - firm grading to a brown f-c sand w/ little to some gravel	✓ change @ 64' (SM) ✓ change @ 70' (SP)		

FIELD BORING LOG			BORING NO. ^N ELM-89-02A		
PROJECT NO.: 5753-	PROJECT NAME: USATHANA- BAAP			PAGE 2 OF 2	
DRILLING CONTRACTOR: LAYNE-NORTHWEST		DRILLER: G. Rodriguez	DATE STARTED 1/24	COMPLETED 1/24/89	
METHOD: <u>Double</u>	CASING SIZE: 9"OD/6.25 ID	TIP W: 10.6	PROTECTION LEVEL: 10		
GROUND ELEV.: NA	SOIL DRILLED: 140'	WATER LEVEL: 138	TOTAL DEPTH: 140'		
LOGGED BY: <u>gmn</u>		CHECKED BY:	DATE:		

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TYP	VAL
S-8	70-80			Brown f-c sand w/ sub rounded gravel (sm. lg)	(SP)		
S-9	80-90			lt. Brown f-m sand w/ tr c-sand, tr sm. gravel	(SP)		
S-10	90-100'			Same as above little red-brown f. sand	(SP)		
S-11	100-110			Gravel (sm. lg) w/ cobbles w/ little f-c sand grading to a f-c sand + gravel w/ depth	103' Gravel 106' Blow in ✓ Change @ 103' (GP)		
S-12	110-120			Tan, lt. Brown f. M sand w some c-sand, little sm. med gravel	✓ Change @ 110' (SP)		
S-13	120-130			Same as S-12	(SP)		
S-14	130-140			Same as S-13 increase in gravel content	(SP)		
S-15	140-150			Brown Silty Silt w/ tr clay tr f. sand - damp stratified	✓ Change @ 140' (ML)		
				BOB - 140'			

FIELD BORING LOG

BORING NO. ELM-89-03

PROJECT NO.: 5753-08	PROJECT NAME: USATHAMA-BAAP	PAGE 1 OF 3
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: G. Rodriguez	DATE STARTED 1/24/88 COMPLETED 1/25/89
METHOD: Dual Wall	CASING SIZE: 9.00" O.D. / 6.6" I.D.	TIP Ø: 10.6
GROUND ELEV.: 914.0	SOIL DRILLED: 180'	WATER LEVEL: 134.5'
LOGGED BY: SNW	CHECKED BY:	DATE:
PROTECTION LEVEL: D		
TOTAL DEPTH: 180'		

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	REL.
S-1	0-10'			Reddish Tan f-sand w/ tr. c. sand tr. gravel, moist. tr. silt 'poorly graded	0-4.0' TOP SOIL		
S-2	10-20'			1st Tan f-sand w/ tr. m-c sand tr. silt 'poorly graded moist (SP)			
S-3	20-30'			1st Tan to Brown f-sand w/ tr. silt tr. m-c sand - darkening w/ depth. 'poorly graded. Silt content increases w/ depth (SP)			
S-4	30-40			1st Tan to Reddish brown Stratified f-m-c sand + gravel - fine sand lenses; well graded S + G Stratum; washed pan gravel (SP) (SW)	✓ change @ 30'		
S-5	40-50'			Brown Sand + gravel well graded Change ✓ 43 - gravel layer 46 - gravel 47 - Rounded gravel > cobbles ↓ Subrounded 50	Partial loss of circulation due to size of gravel; sand penetration (SW)		
S-6	50-60'			Brown M-c Sand & Gravel w/ little fine; tr silt (SW)			
S-7	60-70'			Stratified Sand & Gravel gravel content increases w/ depth (SW)			
S-8	70-80			Same as S 7 Gravel increases w/ depth (SW)	76' - Gravel Strata		

FIELD BORING LOG				BORING NO. ELM-89-03	
PROJECT NO.: 5753-		PROJECT NAME: USATHAMA- BAAP		PAGE 2 OF 3	
DRILLING CONTRACTOR: LAYNE-NORTHWEST		DRILLER: G. Rodriguez		DATE STARTED 1/24/89 COMPLETED 1/25/89	
METHOD: Dual Well		CASING SIZE: 9.00" O.D. / 6.6" O.D.		TIP IN: 10.6	
GROUND ELEV.: 914.0		SOIL DRILLED: 180'		WATER LEVEL: 134.5'	
LOGGED BY: SNW		CHECKED BY:		DATE:	
				PROTECTION LEVEL: 0	
				TOTAL DEPTH: 180'	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-9	80-90'			Stratified f-c sand + gravel tr. silt, c sand lease at 89-90'	30' change ✓		
S-10	90-100			Same as above fining w/depth to a f-c sand w/ sm gravel	(SP)		
S-11	100-110			Same as above more gravel + larger gravel w/depth	(SP)		
S-12	110-120			predominantly Gravel sm-med little f-m-c sand	hard penetration hard " ✓ @ 110'		
S-13	120-130			Same as above	(SW)		
S-14	130-140			Same as above 134.0 - apparent after completion	(SW)		
S-15	140-150			Same as above	(SW)		
S-16	150-160			Gravel 4 ar 159 - sand Statum - fm sand w/ little gravel	150 ✓ change @ 150'		
				(SP)			

FIELD BORING LOG

BORING NO. *ELM-89-02* ⁰³ *98P*

PROJECT NO.: 5753-

PROJECT NAME: USATHAMA- BAAP

PAGE *3* OF *3*

DRILLING CONTRACTOR: LAYNE-NORTHWEST

DRILLER: *G. Rodriguez*DATE STARTED *11/24/89*COMPLETED *11/25/89*METHOD: *Down Wall*CASING SIZE: *90" O.D. / 66" ID*TIP QV: *10.6*PROTECTION LEVEL: *D*GROUND ELEV.: *914.0*SOIL DRILLED: *180'*WATER LEVEL: *134.5'*TOTAL DEPTH: *180'*LOGGED BY: *SNW*

CHECKED BY:

DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	CEL
<i>5-17</i>	<i>160-170</i>			<i>Gravel sm - lg w/ ^{coarse} sand</i> <i>f-m sand lenses</i> <i>Gravel size increases w/ depth</i> <i>rounded to 1/4"</i> <i>(SB)</i>			
<i>5-18</i>	<i>170-180</i>			<i>sm-med Gravel tr c. sand</i> <i>wet</i> <i>(Gw)</i>	<i>change @ 170</i>		
				<i>Bob @ 180</i> <i>Pulled up to 150</i> <i>to set well</i> <i>$\overline{D} = 134.5$ below G.S.</i>			

FIELD BORING LOG				BORING NO. ELM-89-05	
PROJECT NO.: 5753-08		PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 1	
DRILLING CONTRACTOR: LAYNE-NORTHWEST		DRILLER: G Rodriguez		DATE STARTED 1-31-89	COMPLETED 2-1-89
METHOD: Dual wall	CASING SIZE: 9"	TIP DV: #10	PROTECTION LEVEL: D		
GROUND ELEV.: 898.2	SOIL DRILLED: 140'	WATER LEVEL: \approx 118	TOTAL DEPTH: 140'		
LOGGED BY: 77 Bragdon		CHECKED BY:		DATE: 2-1-89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
	0-2			Gravel Fill	Fill		
	2-4			DK Brown topsoil (SILT)	(topsoil)		
	4-35			DK Brown Sand Gravel Gravelly SA w/ some gravelly sand (SW)			
	35-73			Lt Brown fine to med SAND w/ trace of fine gravel layers (SP)			
	73-98			SL SILTY GRAVELLY SAND "Till like" (SM)			
	98-140			gravelly SAND w/ some Sandy Gravel generally coarser with depth (SW) Well installed @ 133'			

FIELD BORING LOG			BORING NO. ELM-89-07	
PROJECT NO.: 5753-08		PROJECT NAME: USATHAMA-BAAP		PAGE 1 OF 2
DRILLING CONTRACTOR: LAYNE-NORTHWEST		DRILLER: D. MARKUS	DATE STARTED 4/1/89	COMPLETED 4/18/89*
METHOD: 6.25" ^{hollow stem auger}	CASING SIZE: 4.25" ID.	TIP #V: #5	PROTECTION LEVEL: D	
GROUND ELEV.: 913.7	SOIL DRILLED: 120.0'	WATER LEVEL: NR	TOTAL DEPTH: 120'	
LOGGED BY: T. P. ELLEN		CHECKED BY: J. L. 4/25/89 DATE:		

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
						TIP	LEL
S-1	8'-10'		80%	0-9 Loose. Dk br to bl organic silt grading to med br si fi SAND 8-9. Loose (med br si fi SAND to si silt 9-10 Lt br to tan f-m SAND (SP)		—	
S-2	18'-20'			fi-med (banded) SAND grading from lt tan to rusty br to gy to med br. Bands 1-3 in thickness		—	
S-3	28'-28.5'		100%	f-m in SAND w/ gravel and cobbles Cobble zone from 20-36, probably deeper (SP)	* Spec refused on cobbles	—	
S-4	38'-40'		100%	f-m lt br SAND w/ gravel (SP)		—	
S-5	48'-50'		75%	f-m lt br SAND w/ some gravel and tr cobbles (SP)	Spec refused @ 18"	—	
S-6	58'-60'		50%	f-m lt br gravelly sand w/ tr cobbles	Spec refused @ 12" (D=59')	—	
S-7	68'-70'		70%	f-m lt br gravelly SAND w/ tr cobbles fault grading to med tan gravelly SAND. (SP) (upper portion sample probably core).		—	
S-8	78'-80'		25%	tan med SAND (SP)	(Spec refused @ 6")	—	
S-9	88'-90'		20%	lt br f-m gravelly SAND (SP)	(Spec refused @ 6")	—	
S-10	98'-100'		25%	lt br to tan med gravelly SAND (SP)		—	
S-11	108'-110'		25%	lt br f-m gravelly SAND SP		—	
S-12	118'-120'		10%	lt br m gravelly SAND (SP)		—	
				ABANDONED BORING DUE TO COBBLES & BROKEN HSA @ 20'			

* Boring completed by AP-1000 & DUAL WALL Drilling methods.

FIELD BORING LOG				BORING NO. ELM-89-07	
PROJECT NO.: 5753-08		PROJECT NAME: USATHAMA- BAAP		PAGE 2 OF 2	
DRILLING CONTRACTOR: LAYNE-NORTHWEST		DRILLER: G. Rodriguez		DATE STARTED 4/17/89 COMPLETED 4/18/89	
METHOD: AP-1000	CASING SIZE: 9 3/4"	TIP Ø: .	PROTECTION LEVEL: D		
GROUND ELEV.: 913.7	SOIL DRILLED: 170'	WATER LEVEL: 140' ±	TOTAL DEPTH: 170'		
LOGGED BY: BUSS		CHECKED BY: JOP 4/26/89		DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S#1 0-10				For detailed Soil description see log prepared when HSA initially drilled well. brown fine-med SAND w/ numerous cobbles + boulders. some silt + fine sand. (P) very hard driving on (GP) boulders at 120-120 ft.			
S#13 120-130				dry, v. hard gravel, cobbles + boulder. Much dust in cyclone + angular gravel from driving through boulders.		0.2	
S#14 130-140				hard med-gravel, cobbles + boulders. dry. Moist sand and gravel zone 134-137 ft.	▽ = 140 ft.	0.1	
S#15 140-150				Med - fine GRAVEL w/ some coarse gravel + cobbles little med-coarse sand wet		0.3	
S#16 1				Coarse - Med SAND w/ some (+R) gravel, cobbles + boulders little fine SAND		0.4	
S#17				fine-med sand w/ coarse sand cobbles + boulders.		0.5	

FIELD BORING LOG

BORING NO. EM-89-08

PROJECT NO.: 5753-08

PROJECT NAME: USATHAMA- BAAP

PAGE 1 OF 1

DRILLING CONTRACTOR: LAYNE-NORTHWEST

DRILLER: D. MARKUS

DATE STARTED 3/30

COMPLETED 4/1/89

METHOD: 6.25" ϕ AUGER

CASING SIZE: 6.25" I.D.

TIP #5

PROTECTION LEVEL: D

GROUND ELEV.: 903.0

SOIL DRILLED: 149

WATER LEVEL: 131

TOTAL DEPTH: 149'

LOGGED BY: R. P. AMEN

CHECKED BY: J. D.

DATE: 4/10/89

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-1	8-10		24/25 127	f-m SAND w/ gravel and cobbles - very heavy, hard drilling	(0-2' = loose, dk br to 14' moist silty w/ organic) 0-2' to 20'	—	—
S-2	20-22		24/24 100%	Med SAND w/ gravel, to cobbles	(SP) Cbble zone from 2-20'	—	—
S-3	28-30		100%	Med lt br SAND w/ to oilt, some gravel and cobbles		—	—
S-4	38-40		100%	Similar to S-3	(SP)	—	—
S-5	48-50		50%	Similar to S-3. Sample has fragments of friable gneiss/granitoid	Spun refusal on apparent cobbles @ 49'	—	—
S-6	58-60		50%	Med lt br to tan SAND w/ some gravel and to cobbles	Spun refusal on cobbles @ 59'	—	—
S-7	68-70		40%	Med lt br to tan SAND w/ some gravel and cobbles	Spun refusal on cobbles @ 66'	—	—
S-8	78-80		60%	Tan med SAND w/ some gravel		—	—
S-9	88-90		80%	lt tan SAND	(SP)	—	—
S-10	98-100 103-106		25%	lt br to tan med SAND w/ to gravel		—	—
S-11	108-110		10%	Cobble zone		—	—
S-12	118-120		25%	lt br med to coarse SAND w/ gravel and cobbles gravelly		—	—
				lt br med to coarse SAND w/ some cobbles	(SP)	—	—
	(No samples below 120') ∇ @ 131.0'						
BOLT	149						

FIELD BORING LOG

BORING NO. ELM-8409

PROJECT NO.: 5733-DE	PROJECT NAME: USATHAMA-BAAP	PAGE 1 OF 2
DRILLING CONTRACTOR: LAYNE-NORTHWEST	DRILLER: M. DANIELS	DATE STARTED 4/10/89 COMPLETED 4/13/89
METHOD: HSA	CASING SIZE: 4.25" ID	TIP GV: 10.6 PROTECTION LEVEL: D
GROUND ELEV.: 99.6	SOIL DRILLED: 160	WATER LEVEL: 140 TOTAL DEPTH: 160
LOGGED BY: BCM	CHECKED BY:	DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-1	0-2	FROM CUTTINGS		DARK OLIVE TO DARK BROWN CLAYEY SILT, MEDIUM PLASTICITY, MOIST, ORGANIC MATERIAL PRESENT ML	COBBLES STARTING @ 3'	0.0	
S-2	10-12	PUSHED	1.5 / 0.6	BROWN GRAVELLY SAND, WELL GRADED F-C SAND, 20-30% SAND F-C GRV, TRACE SI, DRY, MOD DENSE SW	COBBLES	0.0	
S-3	20-22	PUSHED	1.0 / 1.0	TAN, GRAVELLY SAND TO VERY FINE SAND, 20-30% SAND F-C GRV, TR SI, DRY, LOOSE SW/SP	✓ CHANGE 21'	0.0	
S-4	30-32	PUSHED	1.0 / 0.9	BROWN SAND, W GRD F-M, LI, SAND F-C SAND, DAMP, MOD DENSE SW	✓ CHANGE @ 30'	0.0	
S-5	40-42	PUSHED	2.0 / 2.0	TAN SAND, P GRD, VF TO M SA W/ A 0.4' BLUE SI LAYER, MOD PLASTIC, AT 40.6', DRY, LOOSE SP	✓ CHANGE @ 40'	0.0	
S-6	50-52	PUSHED	1.0 / 1.0	30-50.5 TAN, P GRD, F-M SA, LOOSE, DAMP SP 50.5-51 BROWN GRAVELLY SAND, P GRD F-M, 20-30% SPD C GRV, MOD DENSE, DAMP SP (SHARP CONTACT @ 50.5')		0.0	

BORING NO. ELM-8909

PROJECT NAME: USATHAMA- SAAP

PAGE 2 OF 2

DRILLER: M. DAWIELS

DATE STARTED 4/10/89

COMPLETED 9/13/85

METHOD: HSA

CASING SIZE: 6.25

TIP cv: 10.6

PROTECTION LEVEL: D

GROUND ELEV.: 919.6

SCIL DRILLED: 160

WATER LEVEL: 140

TOTAL DEPTH: 160

LOGGED BY: BCM

CHECKED BY:

DATE:

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	REL.
S-7	60-62	PUSHED	0.5 0.5	BROWN SAND, P GRD, F-M, TR C, SO F-C GRV, LOOSE, DAMP SP		00	
S-8	70-72	PUSHED	0.6 0.5	BROWN SAND, W GRD F TO C SA W/ LI SPD C GRV MOD DENSE, DAMP SW	COBBLES ✓ change @ 70'	0	
S-9	80-82	PUSHED	0.5 0.5	BROWN SAND, P GRD, F TO M, LI C SA TO C GRV, MOD DENSE, DAMP SP	COBBLES ✓ change @ 80'	0	
S-10	90-92	PUSHED	0.5 0.4	AS ABOVE W/ INCREASE IN P GRV SP			
S-11	100-102			ALL CAVE, NOT SAMPLED			
S-12	110-112	PUSHED		BROWN SAND, P GRD, F-M, TR CSA - F GRV, DAMP SP		0	
S-13	120-122	PUSHED		AS ABOVE W/ LITTLE C SA - F GRV, DAMP SP		0	
S-14	130-132	PUSHED		SAND BROWN SAND, P GRD, F-M SA, TR CSA - F GRV, DAMP SP		0	
BOB @ 160							

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
 Location Baraboo, Wisconsin

Boring No. ELN-82
 Surface Elevation 902.8
 Job No. C 10313
 Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	Type	Recovery ↓	Moisture ↓	N	Depth		φ	W	LL	PL	D
1	SS	18"	M	6	0	12" Silt, Sand & Gravel (Toe of Hill) Medium to Stiff, Dark Brown (10YR 3/3) Silty CLAY (CL)	(1.0)				
2	3"ST	13"	M	-	5	Shelby Tube Pushed Hydraulically from 3-5' at 900 PSI	(1.5)				
3	SS	12"	M	30	10	Medium Dense to Dense, Yellowish Brown (10YR 5/6) Fine to Coarse SAND, Some Gravel, Some Silt & Clay, Occasional Cobbles (SM) More Gravel Encountered at 10'					
4	SS	18"	M	18	10						
5	SS	12"	M	32	15						
6	SS	12"	M	18	20	Medium Dense to Dense, Light Olive Brown (2.5Y 5/6) Fine to Medium SAND, Some Silt & Clay, Little Gravel (SM)	()				Pocket Penetrometer Reading, TSF
7	SS	6"	M	31	25	Lacking Gravel at 25'					
8	SS	7"	M	25	30	Boring Completed to 30' on 3/17/82					
					35						
					40						
					45						

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. ELN-82-01ASurface Elevation 902.8Job No. C 10313Sheet 2 of 3

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		Moisture		N	Depth		q _s	W	LL	PL	D	
No.	Type	↓	↓									
						Boring Completed from 30' - 132' on 3/29/82 Unit: SAMS-2 Chief: Tom O. Very Dense, Light Yellowish Brown (10YR 6/4) Fine to Coarse SAND, Some Silt & Clay, Some Gravel, Occasional Cobbles (SM) 200 Gallons of Mud Loss at 60'						
9	SS	18"	M	53	55							
					60							
					65							
					70							
					75							
10	SS	12"	M	188	80		Very Dense, Pale Brown (10YR 6/3) Fine to Coarse SAND, Some Gravel, Little Silt (SP-SM) 2" Clayey Sand Seam Encountered at 79'					
					85							
					90							

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. ELN-82-01Surface Elevation 902Job No. C-10313Sheet 3 of 3

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		Moisture		N	Depth		q _s	W	LL	PL	D	
No.	Type	↓	↓									
						Very Dense, Pale Brown (10YR 6/3) Fine SAND, Little Silt and Clay (SP-SM)						
11	SS	18'	M	77								
						* Hard, Yellowish Brown (10YR 5/4) Clayey SILT, Trace to Little Sand (ML)						
12	SS	14"	1	63								
WATER LEVEL, OBSERVATIONS While Drilling _____ NW Upon Completion of Drilling _____ Time After Drilling $\frac{1}{2}$ hour _____ Depth to Water <u>26.0'</u> _____ Depth to Cave In _____						GENERAL NOTES Start <u>3/15/82</u> Complete <u>3/29/82</u> Crew Chief <u>JHG/SWg</u> <u>55-</u> Drilling Method <u>CS 0-10</u> <u>FA 10-30'</u> <u>DM/WO 30-132'</u>						

End Boring at 132'

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. ELN-82-01BSurface Elevation 902.4Job No. C 10313Sheet 1 of 1

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	Type	Recovery ↓	Moisture ↓	N	Depth		q _s	W	LL	PL	D
						<p>Note: For more detailed subsurface information, refer to Log of Test Boring No. ELN-82-01A</p> <p>Drilling proceeded hard from 60' to 70'. No mud loss during drilling operation</p>					
					40						
					80						
					120						
						End Boring at 143.5'					
					160						
WATER LEVEL OBSERVATIONS							GENERAL NOTES				
While Drilling _____							Start <u>3/30/82</u> Complete <u>3/30/82</u>				
Upon Completion of Drilling _____							Crew Chief <u>Tom O'Rig</u> SAMS-2				
Time After Drilling _____							Drilling Method <u>DM 0-143.5'</u>				
Depth to Water _____											
Depth to Cave In _____											

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant.....

Location Baraboo, Wisconsin.....

Boring No. ELN-82-01C

Surface Elevation.....

Job No. C 10313

Sheet 1 of 1

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				q _s	W	LL	PL	I
No.	Type	↓	↓	N	Depth						
						Note: For more detailed subsurface information, refer to Log of Test Boring No. ELN-82-01A No mud loss observed during drilling operation End Boring at 153.5'					
WATER LEVEL OBSERVATIONS						GENERAL NOTES					
While Drilling.....						Start 3/29/82 Complete 3/29/82					
Upon Completion of Drilling.....						Crew Chief Tom O Rig SAMS-2					
Time After Drilling.....						Drilling Method DM 0-152					
Depth to Water.....											
Depth to Cave In.....											

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
 Location Baraboo, Wisconsin

Boring No. ELN-82-02A
 Surface Elevation 912.1
 Job No. C 10313
 Sheet 1 of 4

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				G _s	W	LL	PL	D
No.	Type	↓	↓	M	Depth						
1	SS	18"	M	4		Stiff to Very Stiff, Very Dark Grayish Brown (10YR 3/2) Silty CLAY (CL) Shelby Tube Hydraulically Pushed from 3-5'	(1.0)				
2	3"ST	19"	M	-	5		(1.6)				
3	SS	18"	M	6							
4	SS	12"	M	45	10	Medium Dense to Dense, Light Olive Brown (2.5Y 5/4) Fine to Coarse SAND and GRAVEL, Little Silt, Occasional Cobbles (SP-SM)					
5	SS	12"	M	25	15						
6	SS	12"	M	46	20						
7	SS	12"	M	38	25	Dense to Very Dense, Dark Yellowish Brown (10YR 4/4) Fine to Coarse GRAVEL, Some Fine to Coarse Sand, Some Silt & Clay (GM)	()	Pocket Penetrometer Reading, TSF			
8	SS	7"	M	108	30						
					35						
					40	Boring Completed to 30' on 3/18/82					
					45						

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Location Baraboo, Wisconsin

Boring No. ELN-82-0
Surface Elevation 912.1
Job No. C-10313
Sheet 2 of 4

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		Moisture		N	Depth		q _u	W	LL	PL	D	
No.	Type	↓	↓									
					50	Boring Completed from 30' - 130' on 3/31/82 Unit: SAMS-2 Chief: Tom O. Dense, Very Pale Brown (10YR 7/4) Fine SAND, Trace Silt (SP)						
9	SS	18"	M	41	55							
					60							
					65							
					70							
					75							
10	SS	18"	H	45	80		Dense, Yellowish Brown (10YR 5/4) Fine to Coarse GRAVEL & SAND, Little Silt, Occasional Cobbles (GP-GM)					
					85							
					90							

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. ELN-82-02ASurface Elevation 912.1Job No. C.10313Sheet 3 of 4

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				q _u	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
11	SS	18"	M	110	95	Very Dense, Light Yellowish Brown (10YR 6/4) Fine to Coarse SAND, Little Gravel, Trace Silt (SP)					
					100						
					105						
					110						
					115						
					120						
					125						
					130						
					135						
						Boring Completed from 130' - 142' on 4/1/82					
						Unit: SAMS-2 Chief: Tom O.					

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. ELN-82-02ASurface Elevation 912Job No. C 10313Sheet 4 of 4

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture		Depth		q _u	W	LL	PL	D
No.	Type	↓	↓	N							
						Dense, Light Yellowish Brown (10YR 6/4) Fine to Medium SAND, Trace Silt (SP)					
12	SS	18"	W	37	140						
						End Boring at 142'					
					145						
					150						
					155						
					160						
					165						
					170						
					175						
WATER LEVEL OBSERVATIONS						GENERAL NOTES					
While Drilling <u>NW</u>						Start <u>3/18/82</u> Complete <u>4/1/82</u>					
Upon Completion of Drilling						Crew Chief <u>JWG/JS</u> Rig <u>55-1</u>					
Time After Drilling <u>1/2</u> hour						Drilling Method <u>CS 0-10</u>					
Depth to Water						FA <u>10-30</u>					
Depth to Cave In <u>16.0'M</u>						DM/WO <u>30-142'</u>					



Sheet 1 of 1

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				q _s	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
						<p>Note: For more detailed subsurface information, refer to Log of Test Boring No. ELN-82-02A</p>					
End Boring at 151.5'											

WATER LEVEL OBSERVATIONS						GENERAL NOTES	
While Drilling _____						Start <u>4/1/82</u> Complete <u>4/1/82</u>	
Upon Completion of Drilling _____						Crew Chief <u>Tom O</u> Rig <u>SAMS-2</u>	
Time After Drilling _____						Drilling Method <u>DM 0-151.5</u>	
Depth to Water _____							
Depth to Cave In _____							



Project Badger Army Ammunition Plant
Location Baraboo, Wisconsin

Boring No. ELN-82-02C
Surface Elevation 9
Job No. C 10313
Sheet 1 of 1

SAMPLE

No.	Type	↓	↓	N	Depth
-----	------	---	---	---	-------

SOIL PROPERTIES

Qu	W	LL	PL	O
----	---	----	----	---

End Boring at 162.8'

GENERAL NOTES

While Drilling _____
Upon Completion of Drilling _____
Time After Drilling _____
Depth to Water _____
Depth to Cave In _____

Start 4/2/82. Complete 4/2/82
Crew Chief Tom A. SAMS-2
Drilling Method DM 0-1



Project Badger Army Ammunition Plant

Location Baraboo, Wisconsin

Sheet1..... of4.....

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(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. ELN-82Surface Elevation 925.2Job No. C 10313Sheet 2 of 4

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		Moisture		N	Depth		q _s	W	LL	PL	D
No.	Type	↓	↓								
					50	Boring Completed from 30' - 155' from 3/23/82 to 3/24/82 Unit: SAMS-1 Chief: Larry F. Very Dense, Pale Yellow (2.5Y 7/4) Fine to Medium SAND, Little Gravel, Little Silt (SP-SM)					
9	SS	18"	M	90	55						
					60						
					65						
					70						
					75						
10	SS	5"	M	200	80	Very Dense, Pale Yellow (2.5Y 7/4) Fine to Coarse SAND and GRAVEL, Little Silt (SP-SM) Hit a Cobble or Boulder after 6" of Driving at 79'					
					85						
					90						

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. ELN-82-03ASurface Elevation 925.2Job No. C 10313Sheet 3 of 4

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES									
Recovery			Moisture				No.	Type	↓	N	Depth	W	LL	PL	D	
No.	Type	↓	↓	N	Depth											
11	SS	14"	M	188	95	Very Dense, Light Yellowish Brown (10YR 6/4) Fine to Medium SAND, Some Silt & Clay, Little Gravel (SM)										
					100											
					105											
					110											
					115											
					120											
					125											
					130											
					135											
12	SS	14"	M	147	30		Very Dense, Very Pale Yellow (10YR 7/4) Fine to Medium SAND, Little Gravel, Trace Silt (SP)									

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. ELN-82-03ASurface Elevation 925.2Job No. C-10313Sheet 4 of 4

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				q _s	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
					140						
					145						
					150						
13	SS	18"	W	258	155	*					
						End Boring at 155'					
					160	* Hard, Yellowish Brown (10YR 5/4) Silty CLAY, Trace Sand, Trace Gravel (CL)					
					165	ELN-82-03B					
					170						
					175						
WATER LEVEL OBSERVATIONS						GENERAL NOTES					
While Drilling _____						Start <u>2/24/82</u> Complete <u>3/24/82</u>					
Upon Completion of Drilling _____						Crew Chief <u>LS</u> Rig <u>55-2</u>					
Time After Drilling <u>1/2</u> hour _____						Drilling Method <u>CS 0-10'</u>					
Depth to Water <u>6' DM</u> _____						DM/WO <u>10-155'</u>					
Depth to Cave In _____						DC(4") <u>0-10'</u>					

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. ELN-82-03BSurface Elevation 925.5Job No. C 10313Sheet 1 of 1

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		Moisture		N	Depth		G _s	W	LL	PL	D	
No.	Type	↓	↓									
						NOTE: For more detailed subsurface information, refer to Log of Test Boring No. ELN-82-03A						
						Drilling from 90' - 166' performed on 3/25/82						
						End Boring at 166'						

WATER LEVEL OBSERVATIONS						GENERAL NOTES	
While Drilling						Start	3/24/82
Upon Completion of Drilling						Complete	3/25/82
Time After Drilling						Crew Chief	TO Rigs SAMS-1
Depth to Water						Drilling Method	DM 0-166'
Depth to Cave In							

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. ELN-82-04ASurface Elevation 921.4Job No. C 10313Sheet 1 of 4

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	Type	Recovery ↓	Moisture ↓	N	Depth		W	LL	PL	D	
1	SS	18"	M	8		16" TOPSOIL					
2	3"ST	14"	M	-	5	Stiff, Brown to Dark Brown (10YR 4/3) Silty CLAY, Trace of Fine Sand (CL) *	(1.7)				
3	SS	18"	M	5		**	(1.0)				
4	SS	14"	M	16	10	Medium Dense to Very Dense, Light Yellowish Brown (2.5Y 6/4) Fine to Coarse SAND and GRAVEL, Some Silt & Clay (SM)					
5	SS	7"	M	74	15	Encountered at 3' Seam of Very Fine to Fine Sand at 15'					
6	SS	17"	M	42	20	Less Silt, But More Gravel Encountered from 18' to 25'					
7	SS	12"	M	44	25						
8	SS	7"	M	36	30	Boring Completed to 30' on 2/23/82					
					35	* Shelby Tube Hydraulically Pushed at 600 PSI	() Pocket Penetrometer Reading, TSF				
					40	**Loose, Brown to Dark Brown (10YR 4/3) Fine to Medium Clayey SAND, Trace Gravel (SC)					
					45						

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. ELN-82-04ASurface Elevation 921.4Job No. C 10313Sheet 2 of 4

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		Moisture		N	Depth		q _s	W	LL	PL	D
No.	Type	↓	↓								
						Boring Completed from 30' - 153.5' on 3/26/82					
						Unit: SAMS-1 Chief: Tom O.					
					50						
9	SS	18"	M	44	55	Dense, Dark Yellowish Brown (10YR 4/4) Fine to Coarse SAND and GRAVEL, Little Silt, Occasional Cobbles (SP-SM)					
					60						
					65	* Encountered a Layer of Cobbles from 47' to 53'					
					70						
					75						
10	SS	15"	M	50	80	Dense, Very Pale Brown (10YR 7/4) Fine to Medium SAND, Some Gravel, Trace Silt (SP)					
					85						
					90						

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. ELN-82-04ASurface Elevation 921.4Job No. C.10313Sheet 3 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				q _s	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
11	SS	8"	M	238	95 100 105 110 115 120 125	Very Dense, Very Pale Brown (10YR 7/4) Fine to Medium SAND, Little Silt, Trace Gravel, Occasional Cobbles (SP-SM) Pushed a Cobble at 104.5'					
12	SS	NR	M	200+	130 135		No Recovery at 130'				

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. ELN-82-04Surface Elevation 921.4Job No. C 10313Sheet 4 of 4

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				G _s	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
					140	Very Dense, Very Pale Brown (10YR 7/4) Fine to Medium SAND, Some Silt & Clay (SM)					
					145						
					150						
13	SS	18"	W	78	153.5						
					155	End Boring at 153.5'					
					160						
					165						
					170						
					175						

WATER LEVEL OBSERVATIONS						GENERAL NOTES	
While Drilling						Start	2/23/82
Upon Completion of Drilling						Complete	3/26/82
Time After Drilling	1/2 hour					Crew Chief	JWG/JS
Depth to Water	32.0'					Rig	55-1
Depth to Cave In						Drilling Method	CS 0-10'
							FA 10-30'
							DM/WO 30-153.5'



LOG OF TEST BORING

Location Baraboo, Wisconsin.....

Boring No. ELN-82-04B
Surface Elevation 921.9
Job No. C 10313
Sheet 1 of 1

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SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture				q _s	W	LL	PL	D	
No.	Type	↓	↓	N	Depth							
						<p>NOTE: For more detailed subsurface information, refer to Log of Test Boring No. ELN-82-04A</p>						
					50	<p>Based on Cuttings Obtained by Driller, Well Installed in: Fine to Coarse GRAVEL and SAND, Trace Silt</p>						
					100	<p>End Boring at 165'</p>						
					150							
					200							

WATER LEVEL OBSERVATIONS						GENERAL NOTES	
While Drilling _____						Start	3/26/82
Upon Completion of Drilling _____						Complete	3/26/82
Time After Drilling _____						LF	SAMS-T
Depth to Water _____						Crew Chief	Rig
Depth to Cave In _____						Drilling Method	DM 0-165'

**ENGINEERING INC**

LOG OF TEST BORING

Project Badger Army Ammunition Plant

Location Baraboo, Wisconsin

Boring No. ELN-82-04C

Surface Elevation ... 9

Job No. C 10.

Sheet of

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FIELD BORING LOG				BORING NO. <u>NPM-89-01</u>	
PROJECT NO.: <u>6049-04</u>		PROJECT NAME: <u>USATHAMA-BAAP</u>		PAGE <u>1</u> OF <u>2</u>	
DRILLING CONTRACTOR: <u>MATHES</u>		DRILLER: <u>Max Tinnin</u>		DATE STARTED <u>10/17/89</u> COMPLETED <u>10/25/89</u>	
METHOD: <u>Rotary</u>		CASING SIZE: <u>9 in</u>		TIP Ø: <u>10.6</u> PROTECTION LEVEL: <u>D</u>	
GROUND ELEV.: <u></u>		SOIL DRILLED: <u>111.0'</u>		WATER LEVEL: <u>84 FT</u> TOTAL DEPTH: <u>111.0'</u>	
LOGGED BY: <u>J. Buss</u>		CHECKED BY: <u>P. Baker</u>		DATE: <u>11/22/89</u>	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
						TIP	
S#1	0-10	7-8 ft		Black to gray organic topsoil grading to gray silt (loc. ss) -OH-ML moist-wet -few cuttings.	easy driving few cuttings	Bkgd	6
S#2	10-20			Brown fine SAND w/ silt and little med coarse sand SM		Bkgd	7
S#3	20-30			tan , TAN, SAND, MED-V FINE, DRY, MOD GRADED, SM			
S#4	30-40			LIGHT BROWN SAND, MEDIUM, SOME COARSE FINE, DRY, POORLY GRADED, TR FINE GRAVEL, SP			
				RESUME DRIVING CASING @ 12:15 PM, 10/25/89			
S#5	40-50			LIGHT BROWN SAND, MED-FINE, DRY, POOR GRADING, SOME FINE GRAVEL, SP		BKGD	—
S#6	50-60			LIGHT BROWN SAND, MED-FINE, SLIGHTLY DAMP, POOR GRADING, GRAVEL AT 55-56 FT, TR FINE GRAVEL, SP		BKGD	
S#7	60-70			LT BRN SAND, MEDIUM, SM FINE, SL DAMP, POOR GRADING, GRAVELLY, SP	1 ppm ABOVE	BKGD	
S#8	70-80			GRAVEL, DENSE - VERY DENSE FROM 70-75', ROUNDED, WELL GRADED GW	2 ppm ABOVE	BKGD	

FIELD BORING LOG				BORING NO. NPM-84-01	
PROJECT NO.: 6049-04		PROJECT NAME: USATHAMA-BAAP		PAGE 2 OF 2	
DRILLING CONTRACTOR: MATHES		DRILLER: MAC TINKIN		DATE STARTED 10/17/84 COMPLETED 10/25/84	
METHOD: <u>Rotary</u>		CASING SIZE: 9 IN		TIP Ø: 10.6 PROTECTION LEVEL: D	
GROUND ELEV.:		SOIL DRILLED: 111.0		WATER LEVEL: 84 FT. TOTAL DEPTH: 111.0	
LOGGED BY: D. BELAN		CHECKED BY: P. Palmer		DATE: 11/22/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
#9	80-90			GRAVEL, DENSE - VERT DENSE ROUNDED, WELL GRADED, GW	9 ppm manganese	Blank	Blank
#10	90-100			GRAVELLY SAND, COARSE-MED, SOME FINE GRAVEL, WET, SL ODOR, LOOSE, SW (TO 93 FT.) GRAVEL, MEDIUM DENSE, ROUNDED - ANGULAR, WELL GRADED, WET, SL ODOR, GW	13 ppm manganese	Blank	Blank
#11	100-110			GRAVEL, S.A.A. GW	1 ppm		
#12	110-111			GRAVELLY SAND, VERY COARSE-MEDIUM WET, LOOSE, SW	0.5 ppm		
				EOB @ 3:20 PM 111'			

FIELD BORING LOG				Boring No. RPM-91-01	
Project No. 06853-03		Project Name BADGER AAP		Page 1 of 1	
Contractor LAYNE		Driller G. RODRIGUEZ		Date started 10-25-91, completed 10-25-91	
Method Dual Wall	Casing Size 9" O.D.	HNU 11.7/10.2		Protection Level D	
Ground El.	Soil Drilled 110'	2' below ground 98.5		Total Depth 110'	
Logged by RRR		Checked by DBP		Date 10/30/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		
						HNU	LEL	
S-1	0-10'			BROWNISH RED SILTY SAND, WGD, F, TR F GRAVEL, TR COBBLES	(SM)	0	0	0
S-2	10-20'			BROWN-RED SILTY SAND, WGD, M-F, LITTLE C SAND LITTLE F-C GRAVEL	(SM)	0	0	0
S-3	20-30			LT BROWN SAND, WGD, M, SOME F, LITTLE C, LITTLE F GRAVEL, TR C GRAVEL.	(SW)	0	0	0
S-4	30-40			COBBLE AND BOULDER ZONE W/ LITTLE F GRAVEL, F SAND.		0	0	0
S-5	40-50	40-47 47-50		SAME AS ABOVE COBBLES AND C GRAVEL W/ SOME F GRAVEL AND LITTLE F SAND, TR SILT	(SW) MAY BE PUSHING A COBBLE W/ CASING	0	0	0
S-6	50-60	50-57 57-60		SAME AS 47-50' LT BROWN SAND, PCD, FM TR C, TR F GRAV, TR SILT	(SP) SO NOT GETTING A REPRESENTATIVE SAMPLE.	0	0	0
S-7	60-70'			LT BROWN SAND, WGD, F-M LITTLE C, LITTLE F GRAV, TR C GRAV	(SW)	0	0	0
S-8	70-80'	70-76' 76-80		BROWN GRAVELLY SAND, WGD, M-C, LITTLE F GRAV, F, SOME C LITTLE COBBLES LT BROWN SAND, WGD, M-C, LITTLE COBBLES, F, LITTLE F GRAVEL.	(SW)	0	0	0
S-9	80-90'			SAME AS 76-80 EXCEPT SOME F GRAVEL.	(SW)	0	0	0
S-10	90-100'			LT BROWN SAND, PCD, M LITTLE F, LITTLE C	(SP)	0	0	0
S-11	100-110'			LT BROWN-BROWN SANDY GRAVEL AND GRAVELLY SAND, WGD SAND: C, SOME M, TR F GRAVEL: F, LITTLE C	(SW) (GU)	0	0	0

B.O.E. = 110'

FIELD BORING LOG				BORING NO. RPM-89-01	
PROJECT NO.: 6049-04		PROJECT NAME: USATHAMA-BAAP		PAGE 1 OF 2	
DRILLING CONTRACTOR: MATHES		DRILLER: Max Timmin		DATE STARTED 10/15/89 COMPLETED 10/16/89	
METHOD: TH-60	CASING SIZE: 9 in	TIP W: 10.6		PROTECTION LEVEL: D	
GROUND ELEV.:	SOIL DRILLED: 127	WATER LEVEL: 109.7		TOTAL DEPTH: 127	
LOGGED BY: Jim Blass		CHECKED BY: V. Bolmer		DATE: 11/22/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	pH
S#1	0-10 ft			Gray Brown fn-med SAND wt/crse sand and tree gravel wood chips FILL moist sm-sa	easy advance TIP Bkgd = 8	-2.5	10
S#2	10-20 ft			red-brown fn-med SAND wt/ zones of crse sand and grave blue plastic? at ~15 ft FILL moist sp		1.0	9
S#3	20-30 ft			light gray brown silty fine SAND wt little med sand and fine sandy SILT wet ML-sm	TIP Bkgd = 1.9	-1.6	
S#4	30-40 ft			light gray brown fn-med SAND wt occasional gravel layers. boulder zone at 37-38 ft. sm moist		0.3	8
S#5	40-50			light brown fine SAND wt med. sand and gravelly zones boulder at ~45' moist-dry sm	TIP Bkgd = 2.7	0.0	7
S#6	50-60			light gray brown fine-med SAND wt gravel zones sm		0.0	7

FIELD BORING LOG

BORING NO. RPM-89-~~88~~ ⁸⁹

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP	PAGE 2 OF 2
DRILLING CONTRACTOR: MATHES	DRILLER: Max Tindin	DATE STARTED 10/15/89 COMPLETED 10/16/89
METHOD: TH-6D	CASING SIZE: 9 in	TIP GV: 10.6 PROTECTION LEVEL: 0
GROUND ELEV.:	SOIL DRILLED: 121	WATER LEVEL: ~1099.465 TOTAL DEPTH: 127
LOGGED BY: J. Buss	CHECKED BY: P. Belmer	DATE: 11/22/89

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	GR
S#7	60-70			light brown medium-fine SAND Dry, trace silt occasional gravel zones SM	Bkgd = 8-9	10	8
S#8	70-80			light brown fine SAND w/ gravel and cobble and boulder zones dry SM	hard driving	12	8
S#9	80-90			light brown med fine SAND w/ some crse sand and gravel dry. SM	hard driving	bkgd	
S#10	90-100			brown med fine SAND w/ occasional gravel moist, becoming wet at ~95 ft. SM		bkgd	
S#11	100-110			brown med. fine SAND w/ little crse sand and trace gravel. gravel zone at 105 ft SM			
S#12	110-120			brown crse-med SAND, little fn sand + gravel. gravel zones. gravel SM-SP	hard driving		

S#13 120-126

Gray Brown Gravel w/ crse-med SAND (GP)

FIELD BORING LOG				BORING NO. <i>RFM 89-02</i>	
PROJECT NO.: <i>6049-04</i>		PROJECT NAME: <i>USATHAMA- BAAP</i>		PAGE <i>1</i> OF <i>2</i>	
DRILLING CONTRACTOR: <i>MATHES</i>		DRILLER: <i>Max</i>		DATE STARTED <i>10/11/89</i> COMPLETED <i>10/13/89</i>	
METHOD: <i>TH-FC Rotary</i>		CASING SIZE: <i>9 in</i>		TIP ØV: <i>10.6</i> PROTECTION LEVEL: <i>D</i>	
GROUND ELEV.:		SOIL DRILLED: <i>115'</i>		WATER LEVEL: <i>96 ft</i> TOTAL DEPTH: <i>115 ft</i>	
LOGGED BY: <i>Tim D. 155</i>		CHECKED BY: <i>P. Bolner</i>		DATE: <i>11/27/89</i>	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 16-INCHES TIP	NO. OF SEC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
						TIP	LEL
<i>S#1</i>	<i>0-10</i>	<i>-0.3</i>	<i>6</i>	<i>Black organic rich topsoil over silty clayey loess OL - ML-CL</i>	<i>Fast, easy drilling</i>		
<i>S#2</i>	<i>10-20</i>	<i>1.3 (3.3 bls)</i>	<i>5</i>	<i>Brown clayey silt and silty clay with fine sand below 15 ft moist. ML-SM loess</i>	<i>"</i>		
<i>S3</i>	<i>20-30</i> <i>30-40</i>	<i>6.2 (6.4 bls)</i>	<i>9</i>	<i>Brown fine-med. Sand Oatmeal moist-dry some fine-med silty gravel zones. (? till.) SM dark mottled boulder at ~35 ft at at 30 ft</i>	<i>generally easy drilling some cobbles & dense gravel zones.</i>		
<i>S4</i>	<i>30-40</i> <i>40-50</i>	<i>12.7 (6.4 bls)</i>	<i>9</i>	<i>similar to S3 SM</i>	<i>anvil/housing for hammer breaking up.</i>		
<i>S5</i>	<i>50-55</i> <i>50-60</i>	<i>9.5 (7.6 bls)</i>	<i>8</i>	<i>Brown fine-med SAND wt. fine + med angular to rounded gravel zones. SM-SP</i>			
<i>S6</i>	<i>50-60</i>	<i>22 (4.4 bls) (moisture?)</i>	<i>9</i>	<i>similar to S6, fine gravel zone at 55 ft SM</i>			

LOG OF TEST BORING
APPENDIX B - 1

Subject: Olin Corporation.....
Badger Ammunitions Plant..
Synthetic Acid Plant.....

Boring Number... NAN 8101 A.....
Surface Elevation... 911.82.....
Job Number... 1724.....
Sheet... 1..... of... 3.....

SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6167

SAMPLE	CLASSIFICATION and Remarks	SOIL PROPERTIES				
		% Gravel	% Sand	% P200	LL	Pl
% Moisture						
Depth						
X -5	(0"-10") Black, Silty Sand & Gravel (10"-24") Black, Sandy Clayey Silt (24"-42") Brown Clayey Silt	0	0	100	42	18
-10	Dark Brown (10YR 3/3) Silty Clay (CL)					
-15						
X -20	Brown (10YR 5/3) and Pale Brown (10YR 6/3) Very Gravelly Silty Sand (SW-SM)	41.5	52.2	6.3	NP	NP
-25						
-30						
-35						
X -40	Brown (10YR 4/3) Sandy Gravel (GW)	76.5	20.9	2.6	NP	NP

LOG OF TEST BORING
APPENDIX B - 2

Project Olin Corporation.....
Badger Ammunitions Plant..
Synthetic Acid Plant...

Boring Number...NAN 8101 A
Surface Elevation...911.82
Job Number...1724
Sheet...2...of...3

SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6107

SAMPLE	CLASSIFICATION and Remarks	SOIL PROPERTIES				
		% Gravel	% Sand	% P200	LL	PI
% Moisture						
Depth						
-50						
-55						
-60						
-65						
X -70	Pale Brown (10YR 6/3) Gravelly Fine Sand (SP)	3.4	94.5	2.1	NP	NP
-75						
-80						
-85						

LOG OF TEST BORING
APPENDIX B - 3

Project: Olin Corporation.....
Badger Ammunitions Plant.....
Synthetic Acid Plant.....

Boring Number...NAN 8101 A.....
Surface Elevation 911.82.....
Job Number....1724.....
Sheet.....3.....of.....3.....

SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6167

SAMPLE	CLASSIFICATION and Remarks	SOIL PROPERTIES				
		% Gravel	% Sand	% P200	LL	Pl
% Moisture						
Depth						
95						
X 100	Brown (10YR 5/3) Coarse Sandy Gravel (GP)	82.1	17.5	0.4	NP	NP
105						
110						
115						
X 120	Brown (10YR 5/3) Gravelly Medium to Fine Sand (SW)	10	89.4	0.6	NP	NP
125						
X 130	Brown (10YR 5/3) Very Gravelly Sand (SW)	34.7	63.7	1.6	NP	NP
	(Groundwater level at 131.5 feet)					

LOG OF TEST BORING

APPENDIX B - 4

Client: Olin Corporation
 Badger Ammunitions Plant
 Location: Synthetic Acid Plant

Boring Number: NAM 8102 B
 Surface Elevation: 914.54
 Job Number: 1724
 Sheet: 1 of 3

R. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6167

SAMPLE		CLASSIFICATION and Remarks	SOIL PROPERTIES				
% Moisture	Depth		% Gravel	% Sand	% P200	LL	PI
		(0-10") Brown Silty Clay (10"-24") Light Brown Silty Sand with Gravel					
X	-5	Dark Yellowish-Brown (10YR 3/4) Silty Clay (CL)	0	1.9	98.1	48	23
X	-10	Brown (10YR 5/3) Very Gravelly Silty Sand (SW-SM)	44.2	48.6	7.2	NP	NP
X	-20	Yellowish-Brown (10YR 5/4) W Slightly Silty, Very Sandy Gravel (GW-GM)	50.2	44.6	5.2	NP	NP
X	-30	Dark Grayish-Brown (10YR 4/2) Very Sandy Gravel (GW)	62	36	2	NP	NP
X	-40	Brown (10YR 5/3) Very Gravelly Sand (SW)	43.5	55.3	1.2	NP	NP

LOG OF TEST BORING
APPENDIX B - 5

Project, Olin Corporation
Badger Ammunitions Plant
Location, Synthetic Acid Plant ...

Boring Number... NAM 81
Surface Elevation... 91
Job Number... 1724
Sheet... 2 ... of ... 3

R.F. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6.5

SAMPLE		CLASSIFICATION and Remarks	SOIL PROPERTIES				
↓ % Moisture	Depth		% Gravel	% Sand	% P200	LL	PI
X	-50	Brown (10YR 5/3) Gravelly Sand (SW)	18	81.4	0.6	NP	NP
	-55						
	-60						
	-65						
	-70						
	-75						
X	-80	Brown (10YR 5/3) Gravelly Sand (SW)	23.1	76.5	0.4	NP	NP
	-85						

LOG OF TEST BORING
APPENDIX B - 6

Project... Olin Corporation
... Badger Ammunitions Plant
... Synthetic Acid Plant

Boring Number... NAM 8102 B
Surface Elevation... 914.54
Job Number... 1724
Sheet... 3... of... 3

F. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6167

SAMPLE		CLASSIFICATION and Remarks	SOIL PROPERTIES				
% Moisture	Depth		% Gravel	% Sand	% P200	LL	Pl
	95						
X	100	Brown (10YR 5/3) Gravelly Sand (SW)	24	75.4	0.6	NP	NP
	105						
	110						
	115						
X	120	Brown (10YR 5/3) Medium to Fine Sand (SP) Slightly Gravelly	4.3	95	0.7	NP	NP
	125						
	130	(Groundwater level at 134.38 feet)					

LOG OF TEST BORING

APPENDIX B - 7

Project. Olin Corporation
 Badger Ammunitions Plant
 Location. Synthetic Acid Plant

Boring Number. NAN 8103 B
 Surface Elevation. 915.06
 Job Number. 1724
 Sheet. 1 of 4

R. L. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6167

SAMPLE		CLASSIFICATION and Remarks	SOIL PROPERTIES				
% Moisture	% Gravel		% Sand	% P200	LL	Pl	
Depth							
		(0-10") Black Sandy Silt and Gravel					
X	-5	(10"-33") Light Brown Silty Sand and Gravel Dark Yellowish Brown (10YR 3/4) Silty Clay (CL)	0	3	97	40	17
X	-10						
X	-15	Dark Yellowish-Brown (10YR 3/4) Sandy Silty Clay with Trace Gravel (CL)	1	23	76	40	19
X	-20	Dark Yellowish-Brown (10YR 3/4) Clayey Sandy Gravel (GW-GC)	75.7	20.1	4.2	NP	NP
X	-30	Brown (10YR 4/3) Gravelly Medium To Coarse Sand (SW)	14.4	84.6	1	NP	NP
X	-40	Grayish-Brown (10YR 5/2) Gravelly Sand (SW)	18.5	81.3	0.2	NP	NP

LOG OF TEST BORING
APPENDIX B - 8

Project...Olin Corporation.....
...Badger Ammunitions Plant
...Synthetic Acid Plant....

Boring Number....NAN.8103.B...
Surface Elevation..915.06...
Job Number...1724...
Sheet.....2.....of...4.....

R.F. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6167

SAMPLE		CLASSIFICATION and Remarks	SOIL PROPERTIES				
↓ % Moisture	Depth		% Gravel	% Sand	% P200	LL	Pl
X	-50	Brown (10YR 5/3) Gravelly Sand (SW)	21.4	78.4	0.2	NP	NP
	-55						
	-60						
	-65						
	-70						
	-75						
X	-80	Brown (10YR 5/3) Gravelly Medium To Coarse Sand (SW)	18.3	81.3	0.4	NP	NP
	-85						

LOG OF TEST BORING
APPENDIX B - 9

Project... Olin Corporation.....
... Badger Ammunitions Plant
... Synthetic Acid Plant....

Boring Number... NAN 8103 B.....
Surface Elevation... 915.06.....
Job Number... 1724.....
Sheet... 3..... of.....

SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6167

SAMPLE	CLASSIFICATION and Remarks	SOIL PROPERTIES				
		% Gravel	% Sand	% P200	LL	PI
% Moisture						
Depth						
95						
X 100	Grayish-Brown (10YR 5/2) Gravelly Sand (SW)	5.6	94.2	0.2	NP	NP
105						
110						
115						
X 120	Brown (10YR 5/3) Gravelly Sand (SW)	22.1	77.5	0.4	NP	NP
125						
X 130	Grayish-Brown (10YR 5/2) Gravelly Sand (SW)	17.5	81.3	1.2	NP	NP

LOG OF TEST BORING
APPENDIX B - 10

Project. Olin Corporation.....
Badger Ammunition Plant..
Location. Synthetic Acid Plant....

Boring Number... NAN 8103 B...
Surface Elevation. 915.06...
Job Number... 1724...
Sheet... 4 of 4...

R.F. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-616

SAMPLE		CLASSIFICATION and Remarks	SOIL PROPERTIES				
↓ % Moisture	Depth		% Gravel	% Sand	% P200	LL	PI
		(Groundwater level at 135.0 feet)					
X	140	Grayish Brown (10YR 5/2) Coarse Very Sandy Gravel (GP)	54	45.9	0.1	NP	NP
	145						
	150						
	155						
	160						
	165						
	170						
	175						

LOG OF TEST BORING
APPENDIX B - 11

Project... Olin Corporation...
... Badger Ammunitions Plant
... Synthetic Acid Plant....

Boring Number... NAN 8104 B
Surface Elevation... 925.11
Job Number... 1724
Sheet... 1... of... 4

J. MARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6167

SAMPLE	CLASSIFICATION and Remarks	SOIL PROPERTIES				
		% Gravel	% Sand	% P200	LL	Pl
% Moisture						
Depth						
	(0-10") Brown Sandy Clay (10"-24") Tan Silty Sand and Gravel					
X -5	Brown (10YR 5/3) Very Sandy Gravel (GW)	53.3	46.4	0.3	NP	NP
X -10	Brown (10YR 5/3) Coarse Very Sandy Gravel (GP)	64	35.8	0.2	NP	NP
X -15	Brown (10YR 5/3) Very Gravelly Medium to Coarse Sand (SW)	25.2	74.7	0.1	NP	NP
X -20	Grayish-Brown (10YR 5/2) Very Gravelly Medium to Coarse Sand (SW)	44.6	55.2	0.2	NP	NP
-25						
X -30	Brown (10YR 5/3) Very Gravelly Medium to Coarse Sand (SW)	31.5	67.9	0.6	NP	NP
-35						
X -40	Brown (10YR 5/3) Very Gravelly Sand (SW)	27.2	72.6	0.2	NP	NP

LOG OF TEST BORING
APPENDIX B - 12

Project...Olin Corporation.....
...Badger Ammunitions Plant
...Synthetic Acid Plant...

Boring Number...NAN.8104.B.....
Surface Elevation...925.11.....
Job Number...1724.....
Sheet....2.....of...4.....

F. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6167

SAMPLE		CLASSIFICATION and Remarks	SOIL PROPERTIES				
% Moisture			% Gravel	% Sand	% P200	LL	Pl
↓	Depth						
X	-50	Brown (10YR 5/3) Very Gravelly Coarse to Medium Sand (SW)	39.8	60	0.2	NP	NP
	-55						
	-60						
	-65						
	-70						
	-75						
X	-80	Brown (10YR 5/3) Very Gravelly Coarse to Medium Sand (SW)	28.9	70.9	0.2	NP	NP
	-85						

LOG OF TEST BORING
APPENDIX B - 13

Project. Olin Corporation.....
Badger Ammunitions Plant.
on Synthetic Acid Plant.....

Boring Number... NAN 8104 B.....
Surface Elevation. 925.11.....
Job Number... 1724.....
Sheet..... 3..... of.....

F. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6167

SAMPLE	CLASSIFICATION and Remarks	SOIL PROPERTIES				
		% Gravel	% Sand	% P200	LL	PI
% Moisture						
Depth						
95						
X 100	Brown (10YR 5/3) Very Sandy Fine Gravel (GW)	58.3	41.6	0.1	NP	NP
105						
110						
115						
X 120	Brown (10YR 5/3) Very Gravelly Sand (SW)	31.8	67.7	0.5	NP	NP
125						
130						

LOG OF TEST BORING
APPENDIX B - 14

Project... Qlin Corporation
... Badger Ammunitions Plant
... Synthetic Acid Plant ...

Boring Number.... NAN 8104 B
Surface Elevation 925.11
Job Number... 1724
Sheet.... 4 of 4

R.F. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6107

SAMPLE		CLASSIFICATION and Remarks	SOIL PROPERTIES				
% Moisture			% Gravel	% Sand	% P200	LL	Pl
↓	Depth						
	X 140	Brown (10YR 5/3) Very Gravelly Sand (SW)	31.2	68.2	0.6	NP	NP
	145	(Groundwater level at 145.0 feet)					
	150						
	X 155	Brown (10YR 5/3) Very Gravelly Coarse to Medium Sand (SW)	38.6	61	0.4	NP	NP
	160						
	165						
	170						
	175						

FIELD BORING LOG				Boring No. 07B-9	
Project No 06853-03		Project Name BADGER AAP		Page 1 of 1	
Contractor LAYNE		Driller E. RODRIGUEZ		Date started 10-29-91 completed 10-29-91	
Method Dual MWL		Casing Size 9" O.D.		HNU 11.71102	
Ground El		Soil Drilled 76'		Protection Level D	
		& below ground		Total Depth 76'	
Logged by KRR		Checked by DRP		Date 10/31/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen HEC	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-1	0-10'			BROWN SILTY SAND, WGD, C, SOME M, SOME F, LITTLE F GRAVEL, LITTLE COBBLES	(SW)	TAR	ATK
S-2	10-20	10-14'		LT BROWN SAND, WGD, SOME M, SOME F GRAV, SOME C GRAVEL	(SW)	B	K G
		14-20'		GRAVEL AND COBBLE ZONE W/ SOME M-C SAND			
SPON # 1	20-21.4	30/50/50	4'		ANALYTICALS		
NO SAMPLE	20-30			SAME AS 14-20'			
S-4	30-40	30-34		SAME AS ABOVE			
		34-40		LT BROWN GRAVELY SAND, WGD, M, SOME F, SOME C, GRAVEL: F, SOME C LITTLE COBBLES	(SW)		
S-5	40-50			LT BROWN SANDY GRAVEL, WGD, F GRAV, SOME C GRAV, SAND: F, SOME M, LITTLE COBBLES OCCASIONAL COBBLE ZONES.			
				QUITE BEDROCK AT 59'			
				B.O.E = 66'			
					QUARTZITE		

1st attempt

FIELD BORING LOG				Boring No. 0PB7101	
Project No. 685909		Project Name USATHAMA		BAA	
Contractor MATHES		Driller T. CRANK		Date started 10.23.91 completed 10.23.91	
Method HSA 4 1/4"		Casing Size —		HNU 11.7 (10.3) #1	
Ground El.		Soil Drilled 17		2 below ground —	
Logged by ES/LC		Checked by DRP		Date 10/24/91	
				Protection Level D	
				Total Depth 17	

TIME

0750

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-1	0-2	5/12/8/ 11	2.0 1.8	0-0.3 gray silty sand and gravel, compacted from roadway 0.3-0.5 yellow silty sand and gravel, dense 0.5-0.7 gray violet silty clayey sand with gravel, slightly plastic in part 0.7-1.0 orange fine to coarse sand with gravel loose, dry 1.0-1.8 black silty clay very dense with gravel, slightly plastic	ANALYTICAL SAMPLE 09101002	OK	OK
S-2	4.5-6.5	2/9/9/ 6	2.0 1.7	brown silty clay, plastic, dense, no horizontal partings, becoming sandy 6.0-6.5 and mottled dark brown.	ANALYTICAL SAMPLE 09101006	OK	OK
S-3	7.5-11.5	50 2"	0.1 0	No RECOVERY	BOULDER DRILLING No SAMPLE	—	—
S-4	14.5-16.5	26/48 42/50 4"	1.9 1.6	brown sandy gravel loose fine to coarse sand (40%) with rounded fine to coarse gravel. dry SW	BOULDER DRILLING Analytical Sample 09101016	OK	OK
				AVG. REFUSAL 17.0' bgs			

0825

2nd redrill

FIELD BORING LOG				Boring No. 0P39	
Project No. 85303		Project Name USATHAMA BAAP		Page 1 of 1	
Contractor MATHES		Driller T. CRANK		Date started 10-23-91 completed 10-23-91	
Method HSA 4 1/4"		Casing Size —		HNU 11.2/10.2 #1 Protection Level D	
Ground EL		Soil Drilled 20		± below ground NA Total Depth 20	
Logged by GS/LL		Checked by DRP		Date 10/24/91	

	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
							HNU	LEL
1040	S-1	0-2	3/5/5/11	2.0 1.6	brown sand with orange mottling 0-0.5 fine to coarse with 40% gravel. Fill 0.5-1.6 brown silty gravelly fill, dense, successive horizontal partings, roots, metal debris in spoon tip	ANALYTICAL SAMPLE	PT 5	PT 5
1050	S-2	4-6	3/4/5/5	2.0 2.0	brown silty clay plastic, dense, no gravel	ANALYTICAL SAMPLE	PT 5	PT 5
	S-3	9-11	15/50/5"	0.9 0.3	gray loose sandy gravel. poor recovery	Reference Sample	PT 5	PT 5
1100	S-4	14-16	25/36/38/42	2.0 1.5	brown sandy gravel loose dry fine to coarse sand with rounded gravel and broken cobble chips	Analytical Sample	PT 5	PT 5
1110	S-5	19-21	50/5"	0.4 0.2	brown sandy gravel poor recovery	Reference Sample		
					AUGER Refusal at 20'			

FIELD BORING LOG				Boring No. <u>DPB-91-02</u>	
Project No <u>6453-03</u>		Project Name <u>Bldg P</u>		Page <u>1</u> of <u>2</u>	
Contractor <u>MATHES</u>		Driller <u>Kerth Buxhauer</u>		Date started <u>10-10-91</u> completed <u>10-10-91</u>	
Method <u>USA/CME 75</u>		Casing Size <u>—</u>	HNU <u>11.7 (102)</u>	Protection Level <u>TD</u>	
Ground EL <u>—</u>		Soil Drilled <u>68'</u>	<u>2</u> below ground	Total Depth <u>68'</u>	
Logged by <u>RHA</u>		Checked by <u>DRP</u>		Date <u>10/11/91</u>	

Time	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring			Soil Sp.
							HNU	LEL		
08:42	S-1 09102006	0-2.5	2 1/2 / 4	1.5 / 1.3	Tan fine Sand; 1" thick clayey silt layer in middle of spou; trace ^{fine} coarse sand and silt, dry. SP	Analytical sample	JAR	ATP		
08:50	S-2 09102007	5-6.5	2 1/4 / 4	1.5 / 1.5	Brown to Black clayey silt; little fine sand; trace coarse sand and organics, dry top soil. CL	Analytical Sample	Bk ₂	Bk ₃	Bk ₄	Bk ₅
08:57	S-3 09102012	10-11.5	2 1/6 / 8	1.5 / 1.5	Gray ^(FNU) clayey silt, mottled; dry. CL	Analytical Sample	Bk ₂	Bk ₃	Bk ₄	Bk ₅
09:05	S-4	15-16.5	2 1/3 / 4	1.5 / 1.5	Gray silty clay, slightly mottled, soft, damp; trace medium sub rounded, purple and coarse sand. CL	Reference	Bk ₂	Bk ₃	Bk ₄	Bk ₅
09:15	S-5 09102022	20-21.5	1 1/6 / 5	1.5 / 1.5	Tan to brown fine Sand, mottled; little clay; trace fine gravel; loose, wet. SC	Analytical	Bk ₂	Bk ₃	Bk ₄	Bk ₅
09:24	S-6	25-26.5	2 1/3 / 4	1.5 / 1.4	Bottom 0.8' - Tan to brown fine Sand; some medium sand; trace coarse sand and fine to medium subangular gravel; Top 0.6' - Tan fine sand; little medium sand; trace coarse sand; damp. SP	Reference	Bk ₂	Bk ₃	Bk ₄	Bk ₅

FIELD BORING LOG				Boring No. 0734	
Project No 6853-C3		Project Name BAAP		Page 2 of 7	
Contractor MATHE'S		Driller Keith Benschmeyer		Date started 10-10-91 completed 10-10-91	
Method HSA/CMR 75		Casing Size —		HNU 11.71(102)	
Ground El		Soil Drilled 68'		Protection Level D	
		2' below ground		Total Depth 68'	
Logged by RHA		Checked by DRP		Date 10/10/91	

Time	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring			
							HNU	LEL		
09:33	S-7	30-31.5	4/5/7	1.5/ 1.5	Tan fine sand; trace coarse sand. 1/4" thick gray clay lenses 0.4' from bottom of spurs; dry. SP	Reference	JAR	ATR		
09:46	S-8	40-41.5	1000/1/3	1.5/ 1.0	Bottom 0.25' - Orange & Brown medium to fine sand; trace fine gravel, coarse sand and silt; wet; Top 0.75' - Olive medium sand; little coarse sand; trace fine to medium subrounded gravel and silt; damp. Tan fine sand in shoe. SW	Reference	B ₂	B ₃	B ₄	B ₅
10:00	S-9	50-51.5	5/6/6	1.5/ 1.5	Bottom 0.3' - Brown silty clay, soft; Top 1.2' - Tan to white fine sand; little medium sand, trace coarse sand and silty clay lenses (thin "ls"); dry CL/SP	Reference Difficult drilling from 55-60' - B ₂ chattering.	B ₂	B ₃	B ₄	
10:14	S-10 09102062	60-61.5	12/19/23	1.5/ 1.0	Shoe contains a cobble of what appears to be orthosite. Tan fine sand ^{and} medium sand; trace fine to coarse subrounded gravel (white quartz and pink quartzite); dry. SP	Analytical Auger refused at 68' will confirm w/split spurs as drillor pulled in. B ₁ of sand hoisted in. See log book for notes.	B ₂	B ₃	B ₄	

FIELD BORING LOG				Boring No. 0PB9103	
Project No. 5853 03		Project Name USATHAMA ISAAP		Page 1 of 3	
Contractor MATHES		Driller T. CRANK		Date started 10-10-91 completed 10-10-91	
Method HSA 4 1/2 3D		Casing Size —		HNU 11.7 (10.2) #3 Protection Level D	
Ground El.		Soil Drilled 99'		2' below ground 92.5' Total Depth 101'	
Logged by SANDIN		Checked by DRP		Date 10/11/91	

1mE

0800

0315

0830

0845

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-1 09103002	0-2	3/3/9/12	2.0 1.7	med gray to brown clay moderately plastic near surface becoming friable and very dense with depth. grass and reed roots in upper foot. some orange mottling in friable clay. OH/OL	ANALYTICAL SAMPLE	JAR	ATP
S-2 09103006	4-6	3/6/7/12	2.0	GRAY to brown mottled silty clay to S.O. S.O - 6.0 reddish orange fine to medium sand, damp, ML	ANALYTICAL SAMPLE		
S-3	9-11	3/5/6/5	2.0 1.8	Brown sand, fine well sorted with occasional tan mottling loose, wet. SP	ANALYTICAL SAMPLE		
S-4	14-16	1/2/2/3	2.0 1.5	Brown to reddish orange fine sand to silty sand. one large rounded gravel, trace small rounded gravel. SP	REFERENCE SAMPLE		
S-5	19-21	1/2/3/2	2.0 1.9	19-20.1 light brown fine sand, well sorted, wet, loose SP 20.1 - 20.8 brown silty sand. sl. plastic	ANALYTICAL		

FIELD BORING LOG				Boring No. 09B91	
Project No 685303		Project Name USATHAMA BAAP		Page 2 of 3	
Contractor MATHES		Driller T. CRANK		Date started 10/10/91 completed 10-10-91	
Method HSA 4 1/2 ID		Casing Size —		HNU 11.7 (10.2) #3	
Ground EL		Soil Drilled 99		2 below ground 92.5	
Logged by E.S.		Checked by DRP		Date 10/11/91	
				Protection Level D	
				Total Depth 101	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-6	24-26	2/4/4/6	2.0 2.0	tan to orange brown mottled fine to medium sand. well sorted, loose wet. coarser texture than S-5 SP	REFERENCE SAMPLE	JAR	ATK
S-7	29-31	1/1/2/5	2.0 1.7	tan to light brown sand, fine well sorted to very fine silty sand damp, loose SM	REFERENCE SAMPLE	ATK	ATK
S-8	39-41	9/13/18/25	2.0 2.0	brown gray clayey silty or sandy silt alternating with fine sand. silt is dense and moderately plastic. wet in places SC	REFERENCE SAMPLE Geologic change	ATK	ATK
S-9	49-51	20/42/40/47	2.0 2.0	light tan fine to coarse sand and rounded gravel. loose, dry. (fill ?) Es SP	Reference Sample	ATK	ATK
0945 S-10	59-61	2/12/20/22	2.0 2.0	tan fine sand trace coarse sand and fine gravel. loose, dry SP	Reference Sample	ATK	ATK
1000 S-11	69-71	23/37/48/50	2.0 2.0	tan very fine sand loose dry, very well sorted with areas of dense silt at SC 69.2-69.3, 70.0-70.1, and 70.5-70.6 Angular contact slump features	Analytical Sample 09103071		

FIELD BORING LOG				Boring No. 0PB9103	
Project No 685503		Project Name USATHAMA HAAP		Page 3 of 3	
Contractor MATHES		Driller T. CRANK		Date started 10-10-91 completed 10-10-91	
Method HSA 4 1/2 ID		Casing Size —		HNU 11.7(10.2) A3 Protection Level D	
Ground El		Soil Drilled 99		2' below ground 92.5 Total Depth 101	
Logged by E. S.		Checked by DRP		Date 10/11/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-12	79-80	18/50	1.0 0.3	loose sand and fine to medium rounded gravel SP	Reference Sample	JAR	ATR
S-13	89-90	17/37/50 For 5"	1.5 1.5	Loose fine sand w/ small percent of angular to rounded gravel, dry SP	Reference Sample		
S-14 091031e1	99-101	213/41 15	2.0 2.0	Brown fine to coarse sand, loose, saturated trace gravel SP BOB 99' augers 101 spoon Water level in augers 92.5' b.g.s.	Analytical Sample		

FIELD BORING LOG				Boring No. 0PB	
Project No 685303		Project Name USATHAMA BAAP		Page 1 of 3	
Contractor MATNES		Driller T. CRANK		Date started 10-10-91 completed 10-11-91	
Method HSA 4 1/4"		Casing Size		HNU 11.7 (10.2) #3	
Ground El		Soil Drilled @ 9.5		2' below ground @ 9.5	
Logged by E.S.		Checked by DRP		Date 10/11/91	
				Protection Level D	
				Total Depth 91.5	

Time	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
							HNU	LEL
1620	S-1 09104002	0-2	2/5/7/13	2.0 1.2	Gray silt with organics (roots) and one med size gravel, dense, low plasticity, friable, ML	ANALYTICAL SAMPLE 09104002	JAR	ATP
1630	S-2	4.5-6.7	3/3/4/6	2.0 2.0	Gray slightly silty clay, dense with some orange/red brown mottling, highly plastic CL	ANALYTICAL SAMPLE 09104006	ATP	ATP
1635	S-3	9.5-11.5	2/3/4/5	2.0 2.0	Gray slightly silty clay, plastic with irregular fine sand lense 10.6-10.9 bright orange red mottled (sand) CL/sm	ANALYTICAL SAMPLE 09104011	ATP	ATP
1640	S-4	14.5-16.5	13-20-20-24	2.0 2.0	Tan fine sand, well sorted, loose, dry alternating with brown friable dense silty clay SP/CL	Reference Sample	ATP	ATP
1650	S-5	19.5-21.5	4/13/21/29	2.0 1.0	tan sand with rounded gravel, loose dry SP	Analytical Sample 09104021	ATP	ATP

FIELD BORING LOG				Boring No. 0PB9104	
Project No. 685303		Project Name USATHAMA BAAP		Page 2 of 3	
Contractor MATWES		Driller T. CRANK		Date started 10-10-91 completed 10-11-91	
Method HSA 4 1/4"		Casing Size —		HNU 11.71(102) #3	
Ground EL		Soil Drilled @ 9.5		2' below ground @ 9.5	
Logged by ES		Checked by DRP		Date 10/11/91	
				Total Depth 91.5	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-6	24.5 - 26.5	8-29 - 38-30	<u>2.0</u> 2.0	tan fine sand with 30% rounded gravel loose, dry SP	Reference Sample	JAR	ATP
S-7	29.5 - 31.5	1-17 - 24-40	<u>2.0</u> 2.0	29.5-30.1 fine to medium sand with small gravel. loose dry SP 30.1-31.5 fine sand well sorted dry, some brown mottling SP	Reference Sample	ATP	
S-8	39.5 - 41.5	14-18 - 24-36	<u>2.0</u> 2.0	sand tan fine to coarse. with trace small gravel. coarser towards bottom. loose, dry. SP	Reference Sample	ATP	
S-9	49.5 - 51.5	4-12 - 16-18	<u>2.0</u> 2.0	tan sand fine loose damp well sorted. silty sand tense at 50.8 with bedding @ 45° to vertical irregular top contact slump or ice melt SP/CL feature?	Reference Sample	ATP	
S-10	59.5 - 61.5	10-17 - 20-28	<u>2.0</u> 2.0	silty sand, silty clay grey with occasional orange red mottling. laminations are at 45° slump feature appearance	Reference Sample	ATP	

FIELD BORING LOG				Boring No. 0800	
Project No. 6253		Project Name USATHAMA BAAP		Page 3 of 3	
Contractor MATHES		Driller T. CRANK		Date started 10-10-91 completed 10-11-91	
Method HSA 4 1/4"		Casing Size —		HNU 11.7 (10.2) # 3	
Ground El		Soil Drilled 89.5		2' below ground 89.5	
Total Depth 91.5					
Logged by E.S.		Checked by DRP		Date 10/11/91	

Sample No	Depth in Feet	Blows per 8 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-11	10-17 -24- 32	Depth 69.5- 71.5	2.0 2.0	tan to light brown sand very fine to fine well sorted, angled lamina and slumped appearance. damp, loose SP	Reference Sample	DRP	
S-12	79.5- 81.5	1- 7-14- 17	2.0 2.0	tan v. fine sand loose dry well sorted SP	Reference Sample	DRP	
S-13	89.5- 91.5	7-8- 10-20	2.0 2.0	light brown v. fine sand to silty sand non plastic, wet. SM BOB AUGERS 89.5 LAST SPLIT SAM 91.5 WATER LEVEL MEASURED IN AUGERS 89.5' bgs	Analytical Sample 09104091	DRP	

10/11/91
0800

FIELD BORING LOG				Boring No. OPB-11-05	
Project No. 6853-03		Project Name BAAP		Page 1 of 3	
Contractor MATHAS		Driller Keith Brumby		Date started 10-10-91 completed 10-11-91	
Method HSA/CMS 75		Casing Size 4.25"	MMU 11.7(10.2)	Protection Level D	
Ground El		Soil Drilled 93	± below ground	Total Depth 93	
Logged by RNA		Checked by DRP	Date 10/11/91		

Time	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		SP-1
							HNU	LEL	
15:23	S-1 09105002	0-1.5	2/2/5	1.5 1.3	Bottom 0.7' - Brown Silty Clay, soft, organics; trace fine gravel; Top 0.6' - Brown to Black clayey Silt; organics, trace fine sand; dry - top soil. OL	Analytical	JAR Bk ₂	ATK Bk ₂	NA Bk ₂
15:32	S-2 09105007	5-6.5	1/3/7	1.5 1.5	Bottom 0.2' - Tan medium Sand; little fine sand, loose; Top 1.3' Gray silty clay, mottled, soft; trace silt, dry SP/CL	Analytical	Bk ₂	Bk ₂	Bk ₂
5:40	S-3 09105012	10-11.5	3/4/10	1.5 1.2	Bottom 0.3' - Brown silty clay, soft, L. mottled 0.3'-0.7' - Brown fine sand; trace silt and fine rounded gravel; U. middle 0.7'-1.0' - Brown fine sand, some silt; trace clay; Top 1.0'-1.2' - Brown fine sand; little silt; trace coarse sand; dry. CL/SC	Analytical	Bk ₂	Bk ₂	Bk ₂
5:47	S-4	15-16.5	12/4/22	1.5 1.5	Bottom 0.7' - white fine Sand; trace medium sand; Top 0.7'-1.5' - Brown fine Sand; little medium sand and silt; trace clay; dry. SP/SM	Reference	Bk ₂	Bk ₂	Bk ₂

* CCL battery went dead.

Bk₂ = Background - 0 ppm

FIELD BORING LOG				Boring No. 07B41-0	
Project No 6853-03		Project Name BAAAP		Page 2 of 3	
Contractor MATHES		Driller Keith Burdette		Date started 10-10-91 completed 10-11-91	
Method HSA/CMETS	Casing Size 4.25"	HNU 11.7 (12.3)	Protection Level D		
Ground El	Soil Drilled 93	± below ground line	Total Depth 93		
Logged by RHA		Checked by DRP		Date 10/11/91	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		SP
							HNU	LEL	
15:55 09105022	S-5	20-21.5	10/18/19	1.5/ 1.3	Bottom 0.4' - Tan to brown fine sand; some medium sand; trace silt; Top 0.4-1.3' - Tan to brown fine sand; little silt; dry. SP	Analytical	JAR BL ₂	ATG BL ₂	Non K ₂
16:00	S-6	25-26.5	12/25/32	1.5/ 1.5	Tan fine sand, varves, trace fine to medium purple gravel, rounded, and clay, dry. SP	Reference	BL ₂	BL ₂	UK ₂
16:05	S-7	30-31.5	10/17/23	1.5/ 1.4	Top Bottom 0.8' - Tan to brown medium and fine sand; some silty fine sand in thick lenses (20); Top 0.8-1.4 - Tan fine sand; dry. SP/SM	Reference	BL ₂	BL ₂	
16:22	S-8	40-41.5	13/19/33	1.5/ 1.5	White fine sand; Brown clayey fine sand lens (20) in middle of span; trace coarse sand and fine rounded gravel; dry. SP	Reference	BL ₂	BL ₂	BL ₂
16:40	S-9	50-51.5	16/27/43	1.5/ 1.5	Bottom 0.5' - Tan medium and fine sand; trace coarse sand; Top 0.5-1.5 Tan fine sand; trace medium and coarse sand; dry. SP	Reference	BL ₂	BL ₂	BL ₂
16:53	S-10	60-61.5	12/23/36	1.5/ 1.5	Tan fine sand; little medium sand; trace coarse sand; dry SP	Reference	BL ₂	BL ₂	BL ₂

FIELD BORING LOG				Boring No. 08B41-05	
Project No. 6253-03		Project Name BAA?		Page 3 of 3	
Contractor MATHIAS		Driller Keith R. Henschel		Date started 10-10-91 completed 10-11-91	
Method (ISA/CMTS)		Casing Size 4.25"	HNU 11.7 (102)	Protection Level D	
Ground El.		Soil Drilled 93	2' below ground level		Total Depth 93'
Logged by RITA		Checked by DRP		Date 10/11/91	

Time	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		Sht. 2"
							HNU	LEL	
17:12	S-11	70-71.5	7/29/37	1.5/ 1.5	Tan fine sand; trace silt; fine to medium subangular gravel; dry, loose, SP	Reference	JAR ATR	NA	DR
17:41	S-12	80-81.5	39/58/105	1.5/ 1.5	Tan to brown medium sand; little fine sand; little coarse sand and fine to medium subrounded gravel; dry. GW	Reference	PK, PK	PK	PK
07105092	S-13	90-91.5	28/52/55	1.5/ 1.5	10-11-91 Bottom 1.3' - Tan Fine Sand; little silt; trace clay; Top 1.3-1.5' - Brown silty clay; little fine sand, soft; dry SM/CL	Analytical	PK, PK	PK	PK
	S-14	100-101.5				Auger refused at 93' bgs T.D. 93'			

Boring No. DPB-91-06

Project No 6953-03 | Project Name USATHAMA

Page 1 of 1

Contractor MATHES

DRINKER ZWAKELAEVER

Date started 10/23/91 completed 10/23/91

Method HLA

Casing Size 4 1/2" T.D.

HNU 11.7/10.2

Protection Level D

GROUND 2

Soil Drilled	10'
--------------	-----

♀ below ground

Total Depth 12'

Logged by iN(Leh

Checked by DRP

Date 10/23/91

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-1	0-2'	6-10- 10-18	1.5' 2.0'	Black organics over brown SILT, cobbles, gravel, some to little medium to coarse sand, poorly well graded, non-plastic, massive medium dense, dry	Analytical	JAR	ATK
S-2	5-7'	15-15- 14-20	1.0' 2.0'	Brown medium SAND, and COBBLES/GRAVEL, some to little coarse sand, and silt, trace fine sand, poorly well graded, non-plastic, massive, medium dense, dry	ANALYTICAL		BK
S-3	10-12'	16-40- 44-45	2.0'	Brown fine to medium SAND and COBBLES/Gravel, little coarse sand and silt, poorly well graded, non-plastic, massive, very dense, dry	ANALYTICAL		BK
Terminated boring at 12' depth logs							

FIELD BORING LOG				Boring No. <u>DPB-91-07</u>	
Project No <u>6853-03</u>		Project Name <u>USATHAMA - BAPP</u>		Page <u>1</u> of <u>1</u>	
Contractor <u>MATHES</u>		Driller <u>K. BUSELMAYER</u>		Date started <u>10/22/91</u> completed <u>10/23/91</u>	
Method <u>HSA</u>		Casing Size <u>4 1/4"</u>		HNU <u>11.7110.2</u> Protection Level <u>D</u>	
Ground El.		Soil Drilled <u>10'</u>		<u>2'</u> below ground Total Depth <u>12'</u>	
Logged by <u>W. CHILDS</u>		Checked by <u>DRP</u>		Date <u>10/23/91</u>	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-1	0-2'	2-7-5-5	1.1 2.0	Brown organic over brown FINE SAND, COBBLES/GRAVEL, little silt, medium sand, trace coarse sand, well graded, non-plastic, massive, medium dense, dry	ANALYTICAL	JAR BKG	
S-2	5-6.3'	13-17 50/4"	0.8 1.3	Blown medium SAND, COBBLES/GRAVEL, some silt and fine sand, little coarse sand, well graded, non-plastic, very dense, dry	ANALYTICAL		BKG
S-3	10-11'	5/75	0.8 1.0	Brown medium SAND, COBBLES/GRAVEL, Some coarse sand and silt, little silt, well graded, non-plastic, very dense, dry	ANALYTICAL		BKG
				TERMINATED boring at 12.0' depth bys			

FIELD BORING LOG				Boring No. 09B-91-00	
Project No	Project Name USATHAMA - BAPP			Page 1 of 1	
Contractor MATHES	Driller K. R. MEYER	Date started 10/23/91	completed 10/23/91		
Method HSA	Casing Size 4 1/4" ID	HNU 11.7/10.2	Protection Level D		
Ground El	Soil Drilled 10'	3' below ground	Total Depth 12'		
Logged by WCHILDS	Checked by DRP	Date 10/24/91			

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-1	0-2'	4-6-6-5	1.3/ 2.0	Brown fine to med SAND Some gravel and silt little coarse sand, well graded, non-plastic, medium dense, dry	ANALYTICAL	TAR	ATR
S-2	5-7'	10-16 20-23	1.4/ 2.0	^{for} Brown fine to coarse SAND and GRAVEL, Some silt, well- graded, non-plastic dense, dry	ANALYTICAL		BK
S-3	10-11	27-75	0.8/ 2.0	Tan fine to coarse SAND and GRAVEL, little silt, well-graded, non-plastic- very dense, dry	ANALYTICAL		BK
				Terminated boring at 17.0' depth bgs			

FIELD BORING LOG				Boring No. 01B-91-09	
Project No.	Project Name USATHAMA - BAAP			Page 1 of 1	
Contractor MATHE	Driller K. PUSEMEYER	Date started 10/23/91	completed 10/23/91		
Method HSA	Casing Size 4 1/4" ID	HNU 11.7/10.2	Protection Level D		
Ground El.	Soil Drilled 10'	± below ground	Total Depth 12'		
Logged by WCHILDS		Checked by DRP	Date 10/24/91		

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-1	0-2'	2-4-3-3	1.3 2.0	Brown fine to medium SAND and GRAVEL, some silt, trace coarse sand, well graded, non-plastic loose, dry	ANALYTICAL	JAR/ATK	BK
S-2	5-5.7'	45-50/3	.5 .7	Brown fine SAND and GRAVEL, some medium sand, little silt, trace coarse sand, well graded non-plastic, very dense, dry, rock fragment in tip	ANALYTICAL		BK
S-3	10-12	15-15-13-13	1.7 2.0	0.0-1.0 Brown fine to medium SAND and GRAVEL, some silt little coarse sand, well graded, non-plastic, dense, dry 1.0-2.0 Tan medium SAND, some to little fine and coarse sand, poorly graded, non-plastic medium dense, stratified	ANALYTICAL		BK
				Terminated boring at 12.0' depth BAS			

FIELD BORING LOG				Boring No. OPB-91	
Project No	Project Name USA/ITAMP BAPP			Page 1 of 1	
Contractor MATHES	Driller K. BOUSCHMEYER	Date started 10/23/91		completed 10/23/91	
Method HSA	Casing Size 4 1/4"	HNU 11.7/10.2	Protection Level D		
Ground El	Soil Drilled 8'	± below ground	Total Depth 8'		
Logged by WCHILDS		Checked by DRP	Date 10/24/91		

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-1	0-2	2-4-6.7	1.5 2.0	Black organics over brown SILT, some fine Sand, trace fine gravel, poorly graded. Slightly plastic, med. dense, moist	ANALYTICAL	JAR	ATR
S-2	5-7	17-30 11-16	0.8 2.0	Brown/tan fine to medium SAND and fine GRAVEL, some coarse sand, trace silt, well graded, non-plastic, dense dry Refusal at 8', 8', and 6'	ANALYTICAL	BK	
				Terminate 3rd attempt at 6' bgs			

FIELD BORING LOG				Boring No. 0PB9111	
Project No. 685303		Project Name USATHAMA		Page 1 of 1	
Contractor MATHES		Driller T. CLARK		Date started 10-23-91 completed 10-23-91	
Method HSA 4 1/4"		Casing Size —		HNU 11.7 (10.2) #1	
Ground El.		Soil Drilled 9.5		Protection Level D	
		2 below ground —		Total Depth 11.5	
Logged by ES/LL		Checked by DRP		Date 10/24/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
605 S-1	0-2	1/8/7/6	2.0 2.0	brown silty gravelly fill, 30% fine-coarse sand, dense, slightly plastic in places	Analytical Sample 09111002	8/5	8/5
S-2	4.5-6.5	2/3/2/1	2.0 0.5	brown silty gravelly sandy fill, asphalt pieces, round to angular gravel, moist,	Analytical Sample 09111006	8/5	8/5
S-3	9.5-11.5	26/22/27/50	2.0 2.0	brown sand with 30% gravel and one silty clay clast, loose, dry, quartzite chips BOS 9.5 augers 11.5 last spoon	Analytical Sample 09111011	8/5	8/5

FIELD BORING LOG

Boring No. 09B91

Project No 685303	Project Name USATHAMA BAAP	Page 1 of 1
Contractor MATHEES	Driller T. CRANE	Date started 10-23-91 completed 10-23-91
Method HSA 4 1/4"	Casing Size —	HNU 11.7 (10.2) ± 1
Ground El	Soil Drilled 9.5	± below ground NA
Logged by ES/LL	Checked by DRP	Date 10/24/91
		Protection Level D
		Total Depth 10.0

	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
							HNU	LEL
1500	S-1	0-2	2 1/4 / 4 / 6	2.0 / 1.8	0-0.4 brown silty sandy topsoil with organics (roots) and gravel, crumbly texture 0.4-1.8 brown gray silt, dense, moist, trace gravel, occasional sand, parts along horizontal plane	ANALYTICAL SAMPLE 09113002	OK	OK
1510	S-2	4.5-6.5	1 1/2 / 3 / 4	2.0 / 2.0	brown silt, orange mottling, dense, damp, moderately plastic with trace sand and some clay,	ANALYTICAL SAMPLE 09113006	OK	OK
1525	S-3	9.5-11.5 9.5-11.5	50 / 4"	0.3 / 0.2	brown sand, loose dry, fine gravel poor recovery BOB 9.5 AUGERS 10 spoon	ANALYTICAL SAMPLE 09113011	OK	OK

FIELD BORING LOG				Boring No. 0PB9113	
Project No. 685303		Project Name USATHAMM		BAAP	
Contractor MATHES		Driller T. CRANK		Page 1 of 1	
Method HSA 4 1/4"		Casing Size —		Date started 10-23-91 completed 10-23-91	
Ground El.		Soil Drilled B, 9, 9		HNU 11.7 (102) ft	
Protection Level D		8' below ground —		Total Depth 9.0	
Logged by E.S./L.C.		Checked by DRP		Date 10/24/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-1	0-2	2/9/ 9/11	2.0 0.6	brown silty topsoil with organics. trace gravel, moist, dense	ANALYTICAL SAMPLE 09113002	JAR	ATR
S-2	4.5 - 6.5	10/7/ 5/6	2.0 1.6	brown silty gravelly sand, dense, slightly plastic in part AUGER REFUSAL at 8.0 feet move east 10 feet try again — auger refusal at 9 feet move another 10 ft east — auger refusal at 9 feet no additional samples taken BOB 1. 8.0 2. 9.0 3. 9.0	ANALYTICAL SAMPLE 09113006		

BEDRILL

FIELD BORING LOG				BORING NO. OPTB-R9-01	
PROJECT NO.: 6049-04		PROJECT NAME: USATHAMA-BAAP		PAGE 1 OF 1	
DRILLING CONTRACTOR: MATHES		DRILLER: MAX TUNIN		DATE STARTED 11-13-89 COMPLETED 11/13/89	
METHOD: Hammer		CASING SIZE: 9"		TIP EV: 10.02 ✓ PROTECTION LEVEL: D	
GROUND ELEV.:		SOIL DRILLED: 73'		WATER LEVEL: None TOTAL DEPTH: 73.00	
LOGGED BY: NADIA GWINESON		CHECKED BY: P. Bolmer		DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-1	0'-10'			BROWN-GREY SILT CLAY, M. GRAVEL, M. FREE SAND F-COARSE SAND WET GRADING TO GREY-BROWN F. SAND, SOME SILT, SOME GRAVEL AND SILT LAYERS MOIST. 6M	1'/min		
S-2	10'-20'			LT. BROWN F. SAND SOME SILT, SOME GRAVEL, DRY. BOULDERS AT 14' & 17' SM	1' @ 1.25 min		
S-3	20'-30'			LT BROWN-TAN VF. SAND SOME SILT, SOME GRAVEL BOULDER AT 23' 20' SP	1' / 1.5 min		
S-4	30'-40'			TAN VF SAND AND ^{SOME} SILT SOME GRAVEL BOULDERS AT 31' 35' 38' SM	1' / 1.5 min		
S-5	40'-50'			TAN F SAND SOME SILT SOME GRAVEL - BOULDERS AT 43'-48' SM	"		
S-6	50'-60'			TAN F SAND SOME SILT, SOME GRAVEL - BOULDER AT 56' SM	"		
S-7	60'-70'			TAN F. SAND SOME SILT SOME GRAVEL SM BEDROCK AT 66'	"		

DOW 73'

ABANDONED

FIELD BORING LOG			BORING NO. 0PB8901		
PROJECT NO.: 6049-04		PROJECT NAME: USATHAMA- BAAP			PAGE 1 OF
DRILLING CONTRACTOR: MATHES		DRILLER: ED Clark		DATE STARTED 10-11-89 COMPLETED 10/11/89	
METHOD: HSA	CASING SIZE: 4.25" ID	TIP GV: 10.6		PROTECTION LEVEL: MOD. D	
GROUND ELEV.:	SOIL DRILLED: 18'	WATER LEVEL: NA		TOTAL DEPTH: 18'	
LOGGED BY: D. LARUE		CHECKED BY: P. Bolmer		DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-1 008901-000	0.0-2.0	4/6/7/10	$\frac{2.0}{1.5}$	LT. GREY TO GREY/BROWN FINE SANDY SILT. DRY, NON-PLASTIC DENSE (SM) PH-4, RAD-0	S-1 ANALYTIC. SAMPLE TAKEN 0.0-2.0 COBBLES 0-5.0'		21
S-2 008901-005	5.0-6.5	5/55/30	$\frac{1.5}{1.4}$	DK BROWN W/ORANGE BROWN MOTTLED SILTY SAND, DRY TO MOIST, NON PLASTIC, DENSE (SM) PH-3 to 4 RAD-0	S-2 ANAL. TAKEN 5.0' TO 6.5' COBBLES 5.0'-9.0'		21
S-3 008901-010	10.0-12.0'	26/50/84/56	$\frac{2.0}{1.6}$	LT. BROWN SANDY QUARTZITE GRAVEL. DRY, NON-PLASTIC (GP) PH-7 RAD-0 VERY DENSE (SAMPLE COMING UP AS GRAVEL, BUT ACTUAL ROCKS ARE PROBABLY MUCH BIGGER) QUIT AFTER 3rd sample due to rough drilling conditions, and are planning to move to new spec.	S-3 ANAL. TAKEN 10.0'-12.0' BOULDERS 10.0-15.0		21

FIELD BORING LOG			BORING NO. CPB-2502	
PROJECT NO.: 6049-04		PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 4
DRILLING CONTRACTOR: MATHES		DRILLER: Ed. Clark		DATE STARTED 10-14-89 COMPLETED 10-14-89
METHOD: HSA	CASING SIZE: 4.25 ID	TIP Ø: 10.6	PROTECTION LEVEL: Mod D	
GROUND ELEV.:	SOIL DRILLED: 66'	WATER LEVEL: -none-	TOTAL DEPTH: 66'	
LOGGED BY: D. LaRue		CHECKED BY: P. Bolmer		DATE: 11/20/89

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORIN	
			REC.			TIP	LEL
S-1 08902000	0'-2'	1/1/1	$\frac{2.0}{1.4}$	Tan, med. grained clean sand. Well sorted. Non-plastic, very loose, dry (SP) pH-6	S-1 Analytical	$\frac{-3}{-3}$	-2.
S-2 08902005	5'-7'	4/4/2/4	$\frac{2.0}{2.0}$	5'-6': med. brown to orange to grey med gr. sand. Well sorted. Non plastic, very loose, moist. (SP) 6'-7': Grades in to med. brown to dark grey silty clay. Moderate plasticity, moist to saturated. (ML/CL) pH-6 *change at 6.0'	S-2 Analytical	$\frac{-4}{-4}$	
S-3 08902010	10'-12'	8/12/11	$\frac{1.1}{1.3}$	0 to 11.5: Dk. brown to dk. grey silty clay. Low plasticity. medium dense, damp. (ML/CL) 11.5-12.0: dark grey fine grained gravelly sand. Mottling. Non plastic, semi-saturated. (GM) pH-6 *change at 11.5	S-3 Analytical	$\frac{-4}{-4}$	

FIELD BORING LOG			BORING NO. EPB-902 EPB-902	
PROJECT NO.: 6049-04		PROJECT NAME: USATHAMA-BAAP		PAGE 2 OF 4
DILLING CONTRACTOR: MATHES		DRILLER: Ed Clark		DATE STARTED 10-14-89 COMPLETED 10-14-89
METHOD: HSA	CASING SIZE: 4.25 ID	TIP ØV: 10.6	PROTECTION LEVEL: Next ID	
GROUND ELEV.:	SOIL DRILLED: 66'	WATER LEVEL: None	TOTAL DEPTH: 66'	
LOGGED BY: D. LaRue		CHECKED BY: P. Bolmer	DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-4 Reference	15'-17'	1 1/2 / 3 / 3	$\frac{2.0}{2.0}$	15-15.1: Dark grey fine gr sand. Low plasticity, very loose, damp. (SP) 15.1 to 17.0: Lt. grey silty clay. Orange mottling. No plasticity, moist. Last 4" are saturated. pH-6 Cl * change at 15.1	Reference sample	$\frac{-4}{-4}$	29
S 60902020	20'-22'	2 / 3 / 5 / 6	$\frac{2.0}{2.0}$	Lt. grey silty clay. Heavy mottling and ^{59%} organic. No plasticity, loose, moist. Top 3" semi-saturated OH * perched water zone at 15.6 to 20.3'	S-4. Analyt.	$\frac{-4}{-4}$	
S-6 Reference	25'- 30 27	5 / 6 / 7 / 8	$\frac{2.0}{2.0}$	Dark grey silty clay. Mod. plasticity, loose, moist. Trace organic and angular gravel pieces. 2 med. grained tan well sorted sand lens. (sc/cl) pH-6 * change at 29' (approx) from clay to sand	Reference sample	$\frac{-4}{-4}$	

FIELD BORING LOG				BORING NO. CPB2902	
PROJECT NO.: 6049-04		PROJECT NAME: USATHAMA-BAAP		PAGE 3 OF 4	
DRILLING CONTRACTOR: MATHES		DRILLER: Ed Clark		DATE STARTED 10-14-89 COMPLETED 10-14-89	
METHOD: HSA	CASING SIZE: 4.25 ID	TIP Ø: 10.6	PROTECTION LEVEL: Med. D		
GROUND ELEV.:	SOIL DRILLED: 66'	WATER LEVEL: none	TOTAL DEPTH: 66'		
LOGGED BY: D. LaRue		CHECKED BY: P. Bolmer		DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITOR II	
			REC.			TIP	LEL
S-7 Reference	30'-32'	9/17/24/25	$\frac{2.0}{2.0}$	Tan, med. to fine grained clean sand. Mottled. No plasticity, med. dense, damp to dry. Trace heavy mineral, and trace angular gravel PH-6 (SP) *change at 29.0	Reference sample	-4 -4	21
S-8 Reference	40'-42'	9/21/27/40 x	$\frac{2.0}{2.0}$	Med. brown to tan fine to med. gr. sand. Mottled with some organic. No plasticity, dense, damp. (SP) PH-6	Reference sample	-4 -4	
S-9 Reference	50'-52'	10/17/19/21	$\frac{2.0}{2.0}$	Tan, med. to fine grained clean sandy ^{gravelly} sand. Orange mottling. Poorly sorted, no plasticity, medium dense, damp. Some med. brown sandy silt lens. Located above orange mottled area. (SW) PH-6	Reference sample	-4 -4	

FIELD BORING LOG

BORING NO. CPB59C2

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP	PAGE 4 OF 4
DRILLING CONTRACTOR: MATHES	DRILLER: Ed. Clark	DATE STARTED 10-14-89 COMPLETED 10-14-89
METHOD: HSA	CASING SIZE: 4.25 ID	TIP ØV: 10.6
GROUND ELEV.:	SOIL DRILLED: 66'	PROTECTION LEVEL: MCD D
LOGGED BY: D. LaRue	WATER LEVEL: none	TOTAL DEPTH: 66'
CHECKED BY: P. Bolner	DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
5-10 reference	60'-62'	10/13/16/17	$\frac{2.0}{2.0}$	<u>60-61</u> Tan to medium brown medium to fine gr. sand. well sorted. Non plastic. med. density, damp to dry. (SP) <u>61-61.5</u> : Med. brown sandy gravel layer. Gravel size approx 1/2-1". Damp to dry. (GM) <u>61.5-62</u> : Tan, med gr. clean gravelly sand. No plas, poorly sorted, damp to dry. A few very clean med gr sand lens. Very well sorted. (GM) pH-6	Reference sample	$\frac{-4}{-4}$	21
5-11 03962064	64'-66'	9/20/50/105	$\frac{2.0}{1.2}$	med. brown sandy gravel. Poorly sorted. Dense, damp to moist. Too gravel. Unable to drill thru. pH-6 (GW)	5-5 Analytical	$\frac{-4}{-4}$	
				T.D @ 66.0'			

FIELD BORING LOG				BORING NO. CP889C3	
PROJECT NO.: 6049-04		PROJECT NAME: USATHAMA-BAAP			PAGE 1 OF 4
DRILLING CONTRACTOR: MATHES		DRILLER: Ed Clark		DATE STARTED 10-12-89 COMPLETED 10/12/89	
METHOD: HSA	CASING SIZE: 4.25 ID	TIP GV: 10.6		PROTECTION LEVEL: MCCI.D	
GROUND ELEV.:	SOIL DRILLED: 77.8'	WATER LEVEL: NA		TOTAL DEPTH: 77.6'	
LOGGED BY: D. LaRue		CHECKED BY: P. Bolmer		DATE: 10/14/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-1 08903000	0-2'	1/2/3/4	$\frac{2.0}{1.7}$	Dk. brown silt with minor amounts of very fine sand. Mod. plasticity, loose, fairly moist. Some mottling (SM) PH-6 *change at 2.0	S-1 Anal. taken No trouble advancing	$\frac{-46}{-47}$	21.6
S-2 08903005	5'-7'	3/7/11/15	$\frac{2.0}{7.9}$	Lt. grey with orange mottling clayey silt. Moderate plasticity, medium dense. Moist (CL to ML) PH-5 *change at 10.0	S-2 Anal. taken No problems	$\frac{0-3}{12}$	
S-3 08903010	10'-12'	2/2/3	$\frac{1.5}{1.3}$	Lt. brown, medium to fine gr. sand with trace silt. Well sorted. Some mottling. Non-plastic, loose, damp (SP) PH-6	S-3 Anal. taken	$\frac{3}{12}$	
S-4 08903015 reference sample	15'-17'	3/4/5/6	$\frac{2.0}{2.0}$	Tan to medium brown, med. to fine grained sand. Trace silt. Well sorted. Mottled (orange). Non-plastic, loose, dry to damp PH-6 (SP)	Reference sample	$\frac{-5}{-5}$	
S-5 08903020	20'-22'	3/4/3/8	$\frac{2.0}{2.0}$	Lt. brown to orange, medium to fine grained sand. Silty-clay lens at 21.0 to 21.5'. Trace silt. Well sorted. Some mottling. Non plastic, loose, damp. PH-6 (SP)	S-4 Anal. taken smooth drilling	$\frac{-5}{-5}$	

*Tip readings taken with background reading as to no sample reaction

FIELD BORING LOG				BORING NO. 0 PB 5903	
PROJECT NO.: 6049-04		PROJECT NAME: USATHAMA-BAAP			PAGE 2 OF 4
DRILLING CONTRACTOR: MATHES		DRILLER: A. C. R. J. S.		DATE STARTED 10-12-89	COMPLETED 10-12-89
METHOD: HSA	CASING SIZE: 4 25 ID	TIP Ø: 10.6		PROTECTION LEVEL: MOD D	
GROUND ELEV.:	SOIL DRILLED: 77.8'	WATER LEVEL: N/A		TOTAL DEPTH: 77.6'	
LOGGED BY: O. LaRue		CHECKED BY: P. Palmer		DATE: 10/14/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-6 Reference	25'-27'	2/5/5/7	$\frac{2.0}{1.8}$	Tan, med. to fine grained clean sand. well sorted. Non-plastic, loose, damp. Traces of heavy mineral (hornblend?) pH-6 rad-0 (SP)	Reference taken	$\frac{-5}{-5}$	210
S-7 Reference	30'-32'	4/5/5/5	$\frac{2.0}{2.0}$	med. to dark brown, med. gr. clean sand. Mod. to well sorted. Non-plastic, loose. (SP) damp. Traces of heavy min. At: 31.5', enter into a dark brown silty clay with a gravel lens on top. Mod to good plasticity, loose, saturated. (CH-OH) pH-6 *change at 31.5' * Perched water zone at 31.5'	Reference sample. Perched water zone at 31.5	$\frac{-5}{-5}$	
S-8 Reference	32'-34'	8/16/15/15	$\frac{2.0}{1.8}$	Lt. brown silt. Lo plasticity, medium dense, damp to moist. Tan, fine to med. gr. sand lens at 32.2' to 32.3' and 33.2 to 33.3'. Well sorted, damp. Some mottling (ML/CL) pH-7 rad 0	Reference sample	$\frac{-5}{-5}$	
S-9 Reference	40'-42'	9/10/10/15	$\frac{2.0}{2.0}$	med. brown, medium to fine grained sand with trace of silt. Well sorted. Non-plastic, med. dense, damp. Organic layers (2mm thick) at several intervals in sample. Slight mottling. V. fine sand lens @ 41.8 (.5" thick) pH-7 (SP)	Reference sample	$\frac{-5}{-5}$	

FIELD BORING LOG				BORING NO. 04B5403	
PROJECT NO.: 6049-04		PROJECT NAME: USATHAMA- BAAP			PAGE 3 OF 4
DRILLING CONTRACTOR: MATHES		DRILLER: Ed. Clark		DATE STARTED 10/12/59	COMPLETED 10/12/59
METHOD: HSA	CASING SIZE: 4.25 ID	TIP Ø: 10.6	PROTECTION LEVEL: HCD D		
GROUND ELEV.:	SOIL DRILLED: 77.8'	WATER LEVEL: N/A	TOTAL DEPTH: 77.8'		
LOGGED BY: D. LaRue		CHECKED BY: P. Bolner		DATE: 10/14/59	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
5-10 Reference	50'-52'	13/15/18/19	$\frac{2.0}{1.8}$	Tan to med. brown, medium grained sand. Trace of silt. Moderate to well sorted, non plastic, medium dense, damp. Alternating sand and silt lens. Sand lens are med. gr. well sorted, non plastic, damp pH - 6 (SP) *small perched water zone at 48' to 50'. Well saturated sandy silt, dark brown, mod. plasticity. *another small perched water zone at 56'-58'	Reference sample	$\frac{-5}{-5}$	
5-11 Reference	60'-62'	14/23/37/48	$\frac{20}{20}$	60.0 to 60.2: Med. brown med. gr. sand with gravel layer at base. Non-plastic, dense dry to moist. (SP) 60.2 to 61.0: Tan, med. gr. clean sand, well sorted. Non plastic, dense, dry. Traces hornblende. (SP) 61.0-62.0: Tan, med. grained clean, gravelly sand. Poor sorting. Mottling top 1". No plasticity. Grades to finer grained sand to base. Dry to moist. (SP) pH - 6	Reference sample		

FIELD BORING LOG

BORING NO. 0PR8903

PROJECT NO.: 6049-04		PROJECT NAME: USATHAMA- BAAP		PAGE 4 OF 4	
DRILLING CONTRACTOR: MATHES		DRILLER: E.C. Calk		DATE STARTED 10-12-89 COMPLETED 10-12-89	
METHOD: HSA	CASING SIZE: 4.25 ID	TIP ØV: 10.6	PROTECTION LEVEL: Mod. D		
GROUND ELEV.:	SOIL DRILLED: 77.8'	WATER LEVEL: N/A	TOTAL DEPTH: 77.8'		
LOGGED BY: D. LeRue		CHECKED BY: P. Palmer		DATE: 10/14/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
5-12	70'-72'	8/17/15/27	$\frac{2.0}{2.0}$	<p>70.0 to 70.5 Tan, med. grained gravelly sand. Moderate to poorly sorted. Mottled. Non plastic, dense, damp (SP)</p> <p>70.5 to 72.0: med. brown silt mottled, moderate plasticity, med. dense. Moist to semi saturated. (ML-CL) PH - 7.0</p> <p>*change at 70.5 *small perched water zone at 70.5</p>		$\frac{-5}{-5}$	21.0
5-13	77'-78'	61/stopped	$\frac{1.0}{.8}$	<p>sandy gravel (tan) for .5', then tan shale bedrock. Dry. (GP) PH - 8</p> <p>*Hit bedrock at 77.8'. stopped drilling.</p>	Drilling difficult		
				B.O.B. @ 77.8'			

FIELD BORING LOG				BORING NO. 0PB-8904	
PROJECT NO.: 6049-04		PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 5	
DRILLING CONTRACTOR: MATHES		DRILLER: Ed Clark		DATE STARTED 10-13-89 COMPLETED 10-13-89	
METHOD: HSA		CASING SIZE: 4.25 ID		TIP EV: 10.6	
GROUND ELEV.:		SOIL DRILLED: 97.0'		WATER LEVEL: 93.3'	
				TOTAL DEPTH: 97.0'	
LOGGED BY: D. LaFue		CHECKED BY: P. Bolmer		DATE: 10/14/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-1 08904000	0-2'	4/3	$\frac{2.0}{1.5}$	Med. brown sandy silt. Poorly sorted. Low plasticity, loose. damp to moist. Roots, mottled. (ML/CL) pH-6	S-1 Analytical	$\frac{-4}{-2}$	21 c
S-2 08904005	5-7'	2/4/6/7	$\frac{2.0}{1.9}$	lt. brown to lt. grey with orange mottling silty clay. Trace organics. low density high plasticity, moist. (ML/CL) pH-6	S-2 Analytical	$\frac{-2}{-1.5}$	
S-3 08904010	10'-12'	2/9/7/8	$\frac{2.0}{1.9}$	<u>10.0 to 11.0:</u> lt. grey with orange mottling silty clay. Trace organics. Low density, mod. plasticity, moist (ML/CL) <u>11.0 to 11.3</u> orange brown (iron stained) med. to fine gr. silty sand. mod. sorting, low density, damp. layer of gravel at base. () <u>11.3 to 12.0</u> Tan to lt. grey silty clay. moderate to hi plasticity, moist. (SM) pH-6 *change at 11.0 } PID kick *change at 11.3 }	S-3 Analytical	$\frac{-3}{-3}$	
S-4 Reference	15'-17'	6/15/20/38	$\frac{2.0}{2.0}$	<u>15.0 to 15.5</u> med. brown with orange mottling, med. to fine gr. sand. moderate sorting, med. dense to dense, damp to moist. (SP) over next page	Reference sample	$\frac{-3}{-3}$	

FIELD BORING LOG				BORING NO. 07B-0004	
PROJECT NO.: 6049-04		PROJECT NAME: USATHAMA- BAAP		PAGE 2 OF 5	
DRILLING CONTRACTOR: MATHES		DRILLER: Ed Clark		DATE STARTED 12-13-89 COMPLETED 10-13-89	
METHOD: HSA	CASING SIZE: 4 25 ID	TIP ØV: 10.6		PROTECTION LEVEL: Mod. D.	
GROUND ELEV.:	SOIL DRILLED: 97.0'	WATER LEVEL: 93.3'		TOTAL DEPTH: 97.0'	
LOGGED BY: O. LaRue		CHECKED BY: P. Bonham		DATE: 10/14/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-4 continued				15.5 - 17.0 med. brown silty sand. Poor sorting, moist. mottled. Trace organics. (SM) PH-6	Reference Sample		
S-5 089C4020	20-22	10/20/25/40	2.0 2.0	20.0 to 20.5 med. brown silty sand. Poor sorting, no plasticity. dense, damp. (SM) 20.5 to 22.0 Tan, med. to fine grained clean sand. Well sorted. no plasticity, damp. (SP) * Color at 21.7 is med. brown w/ orange mottling. Trace more silt. PH-6 * Change at 20.5	S-4 Analytical Sample	-3 -1.5	
S-6 Reference	25-27	7/13/21/22	2.0 2.0	25.0 to 26.0 Tan, med. gr. clean sand. Well sorted, no plasticity moderate density, damp. Gravel layer at 26.0 ft thick). 26.0 to 27.0 Same type sand; size decreases to fine grained. Clean, damp, no plasticity. Contains small silt lens med. brown in color. (SP) PH-6	Reference Sample	-3 -3	

FIELD BORING LOG				BORING NO. CPB29C4	
PROJECT NO.: 6049-CH		PROJECT NAME: USATHAMA- BAAP			PAGE 3 OF 5
DRILLING CONTRACTOR: MATHES		DRILLER: Ed Clark		DATE STARTED 10-13-89	COMPLETED 10-13-89
METHOD: HSA	CASING SIZE: 4.25 I.D.	TIP cv: 10.6		PROTECTION LEVEL: Med. D	
GROUND ELEV.:	SOIL DRILLED: 97.0'	WATER LEVEL: 93.3'		TOTAL DEPTH: 97.0'	
LOGGED BY: D. LaRue		CHECKED BY: P. Bolner		DATE: 10/14/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-7 Reference	30'-32'	10/25/33/42	$\frac{2.0}{2.0}$	Tan, med. to fine gr. sand. Clean, dense, no plasticity, damp. Sand lens at 31.5 is med gr. few traces of gravel at 30.7'. Some mottling. (SP) pH-6	Reference sample	$\frac{-3}{-2.1}$	
S-8 Reference	40'-42'	12/23/24/30	$\frac{2.0}{2.0}$	<u>40.0 to 41.0</u> Tan, med. to fine gr. sand. Clean, dense, no plasticity, damp. Gravel layer at base. (SP) <u>41.0 to 41.5</u> Tan, silty sand. mod. sorting, no plasticity, semi-saturated. (SM) <u>41.5 to 42.0</u> med. brown, med. to large grained sand. Sub angular to sub-rounded grains. No plasticity. damp (SP) pH-6 * small perched zone at 41.0	Reference sample	$\frac{-3}{-3}$	
S-9 Reference	50'-52'	8/40/44/37	$\frac{2.0}{1.3}$	<u>50.0 to 50.5</u> Tan, med. gr sand, well sorted, damp, no plasticity, dense. (SM) <u>to 51.0</u> : orange, sandy gravel poor sorting, damp. <u>to 52.0</u> : Tan sandy gravel. Damp pH-6	Reference sample	$\frac{-3}{-3}$	

FIELD BORING LOG				BORING NO. CPB2954	
PROJECT NO.: 6049-04		PROJECT NAME: USATHAMA-BAAP		PAGE 4 OF 5	
DRILLING CONTRACTOR: MATHES		DRILLER: <i>Ed Clark</i>		DATE STARTED 11-13-89 COMPLETED 12-13-89	
METHOD: <i>LSA</i>	CASING SIZE: <i>4.25 ID</i>	TIP ØV: <i>10.6</i>		PROTECTION LEVEL: <i>Mod. D</i>	
GROUND ELEV.:	SOIL DRILLED: <i>97.0'</i>	WATER LEVEL: <i>93.3'</i>		TOTAL DEPTH: <i>97.0'</i>	
LOGGED BY: <i>D. LaRue</i>		CHECKED BY: <i>P. Bolmer</i>		DATE: <i>10/14/89</i>	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-10 08904060	60'-62'	7/20/23/22	$\frac{2.0}{2.0}$	*change at 50.5 Tan, med. gr. sand with trace gravel. Moderate sorting, dense, no plasticity. Saturated (SP) *perched water zone from 60.0' to 66.0'	S-5 Analytical	$\frac{-4}{-4}$	
S-11 Reference	65'-67'	10/27/26/33	$\frac{2.0}{1.3}$	<u>65.0 to 66.0</u> med. brown silty sand, fine grained. Trace fines. Slightly mottled. So to no plasticity, dense, saturated. Gravel layer at 65.8 to 66.0 (SM) <u>66.0 to 67.0</u> Tan, med. gr. gravelly sand. Poor sorting. dense, damp (sw) pH-6 *change at 66.0	Reference sample	$\frac{-4}{-4}$	
S-12 Reference	75'-77'	13/25/31/39	$\frac{2.0}{1.3}$	med. brown, med. gr. sand. Traces of gravel. Well sorted, dense, no plasticity, damp to moist. Traces heavy mineral. Alternating med. gr. sand with fine gr. sand lens. (SP/sw) pH-6	Reference sample	$\frac{-4}{-4}$	

FIELD BORING LOG				BORING NO. 0PBB904	
PROJECT NO.: 6049-04		PROJECT NAME: USATHAMA-BAAP			PAGE 5 OF 5
DRILLING CONTRACTOR: MATHES		DRILLER: Ed Clark		DATE STARTED 10-13-89	COMPLETED 10-13-89
METHOD: HSA	CASING SIZE: 4.25 ID	TIP EV: 10.6	PROTECTION LEVEL: Mod. D		
GROUND ELEV.:	SOIL DRILLED: 92.0	WATER LEVEL: 93.3'	TOTAL DEPTH: 92.0'		
LOGGED BY: D. LeBar		CHECKED BY: P. Bolmer		DATE: 10/14/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-13 Reference	85'-87'	14/27/36/45	2.0 1.5	<u>85.0 to 86.0</u> med. brown, med. gr sand with traces of gravel. well sorted, dense, no plasticity. damp to moist. <u>86.0 to 87.0</u> med. brown, silty sand with tan, med. gr. sand lens. Poorly sorted, damp, no plasticity. mottling from 85.0 to 86.0. PH-6 (SP/SM)	Reference sample	-4 -4	
S-14 08904095	95'-97'	15/32/40/62	2.0 1.3	<u>95.0 to 96.0</u> med. brown to tan, med. gr. sand. well sorted. Dense, no plasticity, moist. trace heavy mineral. SP <u>96.0 to 96.5</u> Tan, fine gr. silty sand. moist to semi-saturated. SM <u>96.5 to 97.0</u> med. brown gravelly sand (angular gravel). Poorly sorted, dense, no plasticity. Saturated. Sandy gravel at 97.0'. GM + change at 96.0 + water at 93.3' T.D. @ 97.0	S-6 Analytical Sample	24 -4	

1. water level may be affected by seepage from perched zones above.

FIELD BORING LOG

BORING NO. OPB-8905

PROJECT NO.: 6049-04		PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 5	
DRILLING CONTRACTOR: MATHES		DRILLER: Ed Clark		DATE STARTED 10-15-89 COMPLETED 10/16/89	
METHOD: HSA	CASING SIZE: 4.25 ID	TIP CV: 10 G	PROTECTION LEVEL: Prod. D		
GROUND ELEV.:	SOIL DRILLED: 95.5	WATER LEVEL: none	TOTAL DEPTH: 95.5		
LOGGED BY: D. LaRue		CHECKED BY: P. Palmer		DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-1 08905000	0-2	1 1/2 / 3 / 5	$\frac{2.0}{1.8}$	Dark brown sandy silt. Poorly sorted, moderate plasticity, loose, damp. Roots. Grades to med. brown silty sand. Well sorted, no plasticity, damp. (SM) pH-6	S-1 Analytical	$\frac{-3}{-2.1}$	21
S-2 08905005	5-7	3 / 4 / 4 / 3	$\frac{2.0}{1.3}$	Top 7" - Dark brown med. to fine gr. sand. Med. sorting, no plasticity, loose, damp. (SP) pH-6	S-2 Analytical	$\frac{-3}{-3}$	
S-3 08905010	10-12	2 / 4 / 4	$\frac{1.5}{1.1}$	Alternating lens of med. brown to tan, med to fn gr sand. Well sorted, no plasticity, loose, damp to dry. Contains dk brown sandy silt lens. Med. plasticity, damp. Gravelly silt lens at 11.5' pH-6	S-3 Analytical	$\frac{-3}{-3}$	
S-4 Reference	15-17'	2 / 4 / 6 / 10	$\frac{2.0}{1.6}$	Top 5" med. brown silty sand alternating with med. brown sandy silt. (Mostly sand) Poorly sorted, no plasticity, loose, damp. (SM) At 15.5, it grades into			

FIELD BORING LOG				BORING NO. CFE-5905	
PROJECT NO.: 6049- C4		PROJECT NAME: USATHAMA- BAAP		PAGE 2 OF 5	
DRILLING CONTRACTOR: MATHES		DRILLER: Ed Clark		DATE STARTED 10-15-89 COMPLETED 10-16-89	
METHOD: HSA	CASING SIZE: 4.25 ID	TIP EV: 10.6	PROTECTION LEVEL: Med D		
GROUND ELEV.:	SOIL DRILLED: 95.5	WATER LEVEL: none	TOTAL DEPTH: 95.5		
LOGGED BY: D. LaRue		CHECKED BY: P. Bolmer		DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-4 cont.				a tan, med. gr. gravelly sand. Poorly sorted, loose, damp. Gravel looks like till (sw) pH-6			21
S-5 08905020	20-22	5/8/13/13	$\frac{2.0}{1.8}$	Alternating layers of med. brown, fine gr. gravelly ~ med, Poorly sorted, no plas, med. dense, dry, with tan, med. gr. clean sand. Well sorted. No plasticity, dry, with med. brown/orangish sandy silt lens. mod. to good plasticity, damp. (sw/sm) pH-6	S-4 Analytical	-4 -2.9	
S-6 Reference	25-27	3/4/6/8	$\frac{2.0}{2.0}$	Tan, med. to fine grained clean sand. Well sorted no plasticity, loose, dry. Trace of gravel throughout. (25.4 to 25.5 - med. brown sandy silt lens. No plas, damp) Trace of several other small silt lens. (SP) pH-6	Reference sample	-4 -3.2	

FIELD BORING LOG				BORING NO. 0PB3905	
PROJECT NO.: 6049-04		PROJECT NAME: USATHAMA- BAAP		PAGE 3 OF 5	
DRILLING CONTRACTOR: MATHES		DRILLER: Ed Clark		DATE STARTED 10-15-89 COMPLETED 10-15-89	
METHOD: HSA	CASING SIZE: 4.25"	TIP ØV: 10.6		PROTECTION LEVEL: Mod D	
GROUND ELEV.:		SOIL DRILLED: 95.5'	WATER LEVEL: none	TOTAL DEPTH: 95.5'	
LOGGED BY: D. LaRue		CHECKED BY:		DATE:	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-7 Reference	30-32	4/5/8/11	$\frac{2.0}{2.0}$	Tan, med. to fine grained sand, trace gravel. med sorting, no plasticity. loose to medium dense dry. [From 30-31 gravel size is ~3mm. From 31-31.6, gravel size decreases to lg. gr sand. From 31.6-32: gravel size increases significantly to ~1/2". pH-6 (Gutsw) *change between 32' & 40'	Reference sample	$\frac{-4}{-3.4}$	
S-8 Reference	40'-42'	7/11/15/19	$\frac{2.0}{2.0}$	Tan, med. gr. clean sand. med. sorting, no plas. med. dense, dry. Trace silt lens (med. brown) (SP) Trace heavy mineral pH-6	Reference sample	$\frac{-4}{-4}$	
S-9 Reference	50'-52'	7/11/20/26	$\frac{2.0}{2.0}$	Tan, med. gr. clean sand, med. sorted, med dense, no plasticity, dry. Lite mottling at 51.5'. Gravel layer at 51.5. To 52: med. brown silty clay. med. plasticity, damp. pH-6 *change at 51.5'. (SP) ML	Reference sample	$\frac{-4}{-4}$	

FIELD BORING LOG				BORING NO. CFB5905	
PROJECT NO.: 6049-04		PROJECT NAME: USATHAMA-BAAP		PAGE 4 OF 5	
DRILLING CONTRACTOR: MATHES		DRILLER: Ed Clark		DATE STARTED 10-15-84 COMPLETED 10-16-84	
METHOD: HSA	CASING SIZE: 4.25 ID	TIP ØV: 10.6	PROTECTION LEVEL: Mod D		
GROUND ELEV.:	SOIL DRILLED: 95.5	WATER LEVEL: none	TOTAL DEPTH: 95.5		
LOGGED BY: D. LaRue		CHECKED BY: P. Bolmer		DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-10 Reference	60'-62'	7/16/18/35	$\frac{2.0}{2.0}$	Tan, med. gr. clean sand. Well sorted, non plastic dense, dry. Last 6" see matting (orange) (SP) pH-7	Reference sample	$\frac{-4}{-4}$	21
S-11 Reference	70'-72'	9/23/29/38	$\frac{2.0}{2.0}$	Tan, med. to fine gr. clean sand. Well sorted non plastic, dense, dry. Some matting. * Last 1' is somewhat finer grained and more dense than first foot. (SP) pH-6	Reference sample	$\frac{-4}{-4}$	
S-12 Reference	80'-82'	14/30/62/71	$\frac{2.0}{2.0}$	Top 5" Tan, sandy gravel (~1/2") Poorly sorted, no plasticity, dense, dry. 80.5 to 81.5: Tan, clean med. gr. sand. well sorted, no plas, dry. Matting to 82.0: Tan, med. gr. gravelly sand. Poorly sorted. Dense, no plas. dry. SP pH-6	Reference sample	$\frac{-4}{-4}$	

FIELD BORING LOG				BORING NO. CPB-965	
PROJECT NO.: 6049-04		PROJECT NAME: USATHAMA-BAAP		PAGE 5 OF 5	
DRILLING CONTRACTOR: MATHES		DRILLER: EO Clark		DATE STARTED 10.15.89 COMPLETED	
METHOD: HSA	CASING SIZE: 4.25 ID	TIP GV: 10 G		PROTECTION LEVEL: NOD D	
GROUND ELEV.:	SOIL DRILLED: 95.5	WATER LEVEL: none		TOTAL DEPTH: 95.5	
LOGGED BY: D. LaRue		CHECKED BY: P. Bolmer		DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-13 Reference	90-92'	141/43	$\frac{2.0}{.9}$	Tan, sandy gravel with dominant sandstone. Some till. Very dense, dry. pH-6 SP	Reference sample Drilling difficult	$\frac{.9}{-.4}$	21
S-14 Reference	95-95.5	132-stop	0	Spoon refusal. Nothing in sample but few quartzite chunks.	Reference sample. Tip of spoon cracked.		
				T.D. 95.5			

FIELD BORING LOG				BORING NO. OPB-89-0	
PROJECT NO.: 6049-04		PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 1	
DRILLING CONTRACTOR: MATHES		DRILLER: Ed. Clark		DATE STARTED 10/26/89 COMPLETED 10/26	
METHOD: Augers		CASING SIZE: 4 1/4" ID		TIP NO: #11 106	
GROUND ELEV:		SOIL DRILLED: 15 ft.		PROTECTION LEVEL: D	
LOGGED BY: Buss		CHECKED BY: P. Bolmer		DATE: 11/20/89	
WATER LEVEL: —		TOTAL DEPTH: 7 ft			

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
				boring advanced 3 ft into dense boulders, relocate after refusal. drill 3 addl. ft. refusal again, relocate ~ 25' east, refusal at 2 ft. 8 ft of drilling before setting up on Sinal.	difficult drilling in boulders		
S#1	0-2	6 6 7 8 11	4/24	Black organic over med fine sand w/ gravel cobbles and silt. SR	difficult drilling in boulders.	Bkgd.	
S#2	2-4	6 36 10 32	6/24	Brown to Black med-fn Sand w/ gravel cobbles and silt layers. SR		Bkgd.	
S#3	5-7	8 14 15 16	13/24	Brown to gray med-fn SAND w/ crse Sand and gravel + cobbles. FILL SR			
				7 ft EOB			

Total footage for this boring = 7 + 2 + 3 + 3 = 15 ft

FIELD BORING LOG				BORING NO. OPB-89-07	
PROJECT NO.: 6049-24		PROJECT NAME: USATHAMA-BAAP			PAGE 1 OF 1
DILLING CONTRACTOR: MATHES		DRILLER: Ed Clark		DATE STARTED 10/25	COMPLETED 12/25
METHOD: Augers	CASING SIZE: 4 1/4" ID	TIP GV: #11 10.6		PROTECTION LEVEL: P	
GROUND ELEV.:	SOIL DRILLED: 12 ft	WATER LEVEL:		TOTAL DEPTH: 12 ft	
LOGGED BY: Russ		CHECKED BY: P Bolmer		DATE: 11/24/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S#1	0-2	8 21 26 31	8/24	Black to brown fn-crse SAND with silt + gravel FILL Dry 1 sp Cobble in tip of spoon. boulder at 3 ft. rig pulled forward ~ 3 ft for 2nd attempt.	difficult drilling with many boulders.	Bkgd.	
S#2	5-7	24 23 47 39	8/24	Brown Crse-fn SAND w/ gravel some silt. FILL Dry SP		Bkgd	
S#3	10-12	16 46 63 66	18/24	Brown to gray crse-med SAND w/ gravel FILL Dry. SP 12 ft. BOE		Bkgd	

FIELD BORING LOG				BORING NO. <i>OPB-89-08</i>	
PROJECT NO.: <i>6049-04</i>		PROJECT NAME: <i>USATHANA-BAAP</i>		PAGE <i>1</i> OF <i>1</i>	
DRILLING CONTRACTOR: <i>MATHES</i>		DRILLER: <i>Ed. Clark</i>		DATE STARTED <i>10/26</i> COMPLETED <i>10/26</i>	
METHOD: <i>Augers</i>		CASING SIZE: <i>4 1/4" ID</i>		TIP Wt: <i>#11 10.6</i> PROTECTION LEVEL: <i>D</i>	
GROUND ELEV.		SOIL DRILLED: <i>9.0'</i>		WATER LEVEL: <i>None</i> TOTAL DEPTH: <i>9.0'</i>	
LOGGED BY: <i>Buss</i>		CHECKED BY: <i>P. Bolmer</i>		DATE: <i>11/20/89</i>	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S#1	0-2	4 6 7 5	15 24	Brown Crse.-Fine SAND wt/ gravel, FILL moist SP		Bkgd	
S#2	5-7	13 17 24 25	18 24	light brown Crse.-Fine SAND wt/ gravel, FILL. dry-moist SP		Bkgd	
S#3	7-9	32 60 100	18" 18	oily odor in casing, TIP is up to 6ppm 0.9-Bkgd. * brown med.-Fn SAND wt little silt and some gravel dry TIP= Bkgd SP		Bkgd	

FIELD BORING LOG				BORING NO. 0P3-89-10	
PROJECT NO.: 6049-04		PROJECT NAME: USATHAMA-BAAP			PAGE 1 OF 1
DRILLING CONTRACTOR: MATHES		DRILLER: Ed Clark		DATE STARTED 10-26-89	COMPLETED 10-26-89
METHOD: HSA	CASING SIZE: 4 1/2" 10	TIP W: 10.02 eV		PROTECTION LEVEL: D	
GROUND ELEV.:	SOIL DRILLED: 9'	WATER LEVEL: NA		TOTAL DEPTH: 9'	
LOGGED BY: NSG		CHECKED BY: P. Bolner		DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-1	0'-2'	3 4 12 27	19 1/2 21	BROWN SILTY V.F. SAND. ORGANIC AT TOP - MOIST. SM		BOB	
S-2	5'-7'	6 24 8 11	11 1/2 24	BROWN COARSE-F. SAND AND W/ GRAVEL DRY-MOIST SW		BOB	
S-3	7-9	15 32 25 18	18 1/2 24	BROWN COARSE-F. SAND W/ GRAVEL DRY-MOIST SW		BOB	
				BOB 9'			

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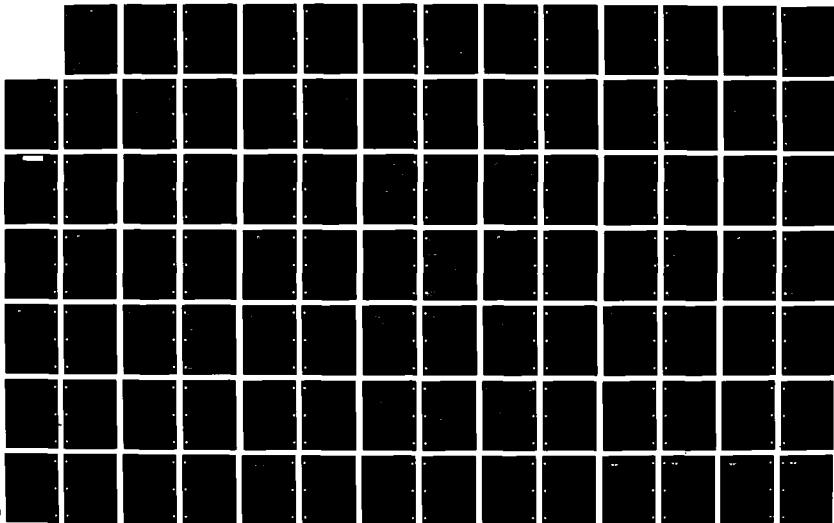
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BARABOO WISCONSIN VOLUME 1 APPENDICES A THROUGH D(U)
ABB ENVIRONMENTAL PORTLAND ME 1991 XA-USATHANA

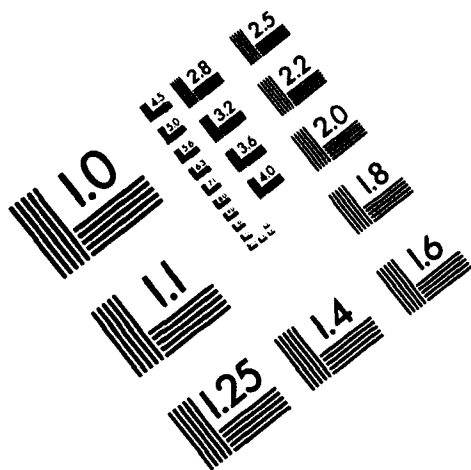
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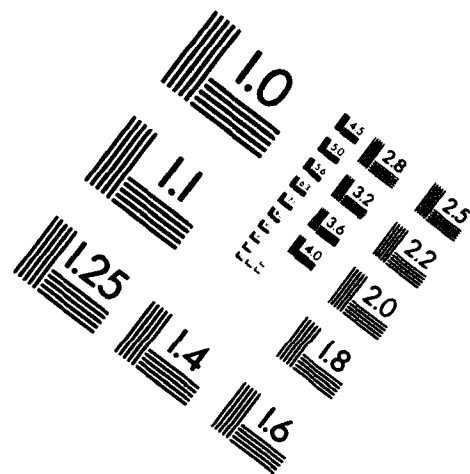


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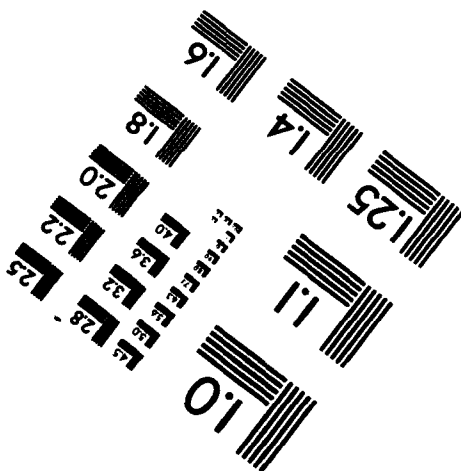
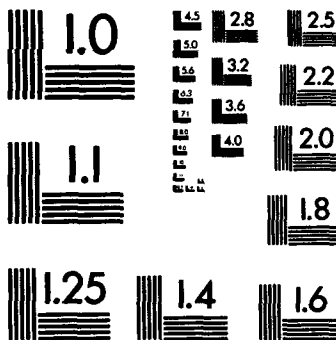
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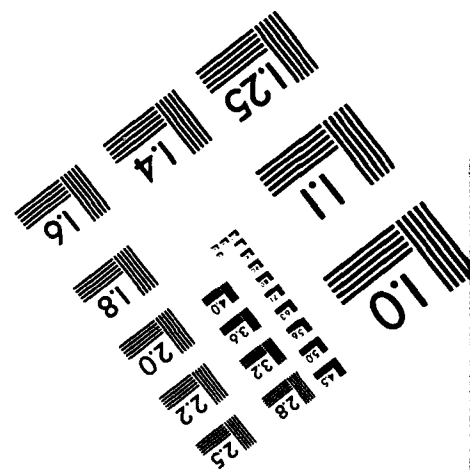
Centimeter



Inches



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FIELD BORING LOG				BORING NO. 0PB-89-11	
PROJECT NO.: 6049-04		PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 1	
DRILLING CONTRACTOR: MATHES		DRILLER: Ed Clark		DATE STARTED 10/26 COMPLETED 10/26	
METHOD: Augers		CASING SIZE: 4 1/4" ID		TIP EV: #11 10.6	
GROUND ELEV.:		SOIL DRILLED: 10.5		PROTECTION LEVEL: D	
		WATER LEVEL: N/A		TOTAL DEPTH: 10.5	
LOGGED BY: Buss		CHECKED BY: P. Bolner		DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S#1	0-2	14 4 6	12 24	4" Tan sand and gravel, roadway fill, over brown silty clay with coarse sand + gravel dry-moist. SP		8kgd	22%
S#2	5-7	11 3 6	19 24	Redish Brown silty clay with little gravel + fine sand. moist-wet FILL ML-CL		3kgd	
S#3	10-10.5	100 5"	0 5"	No Sample recovery, oil odor, TIP = ~30 ppm. - attempt sample collection by removing bottom plug + scraping sidewalls. - brown silty Sn-med sand w/ gravel, wet at upper surface of spoon SP - TIP = 20 ppm VOA + Inorganic sample collected.	Spoon + Auger Refusal at 10 ft.	30ppm	20ppm

FIELD BORING LOG			BORING NO. 08 0PB-89-12	
JECT NO.: 6049- 04		PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 1
DRILLING CONTRACTOR: MATHES		DRILLER: Ed. Clark		DATE STARTED 10/25/89 COMPLETED 10/25/89
METHOD: Augers	CASING SIZE: 4.1/2" ID	TIP ØV: #11		PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 1351	WATER LEVEL: N/A		TOTAL DEPTH: 1351
LOGGED BY: BUSS		CHECKED BY: P. Bolmer		DATE: 11/20/89

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S#1	0-2	5 7 4 5	24/24	Gray Silt, dry wt/ occasional coarse sand + fine gravel, (loess, fill?) sm	Bkgd = ~0.5ppm.	Bkgd	
S#2	5-7	2 3 4 4	24/24	Gray to brown silt and clay moist-wet some iron staining CL-ML Loess		Bkgd	
S#3	10-12	8 9 25 100/3	10/24	very rust colored coarse to med sand and gravel (angular) little fine sand and silt. SP-JM EOB = 13 ft, Auger refused.		Bkgd	

FIELD BORING LOG				BORING NO. OPB-89-13	
PROJECT NO.: 6049-04		PROJECT NAME: USATHAMA-BAAP			PAGE 1 OF 1
DRILLING CONTRACTOR: MATHES		DRILLER: FO CLARK		DATE STARTED 10-26-89	COMPLETED 10-26-89
METHOD: HSA	CASING SIZE: 4 1/4" 10	TIP GV: 10.02 eV		PROTECTION LEVEL: D	
GROUND ELEV.:	SOIL DRILLED: 7.0'	WATER LEVEL: NA		TOTAL DEPTH: 7.0'	
LOGGED BY: NSG		CHECKED BY: P. Bolmer		DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-1	0'-2'	3 4 4 5	25"/24	BROWN SILTY F. SAND TO GRAEL MOIST. GRASS: ROOTS AT TOP 6" SM		DECS	
S-2	5'-7'	6 6 16 17	12"/24	INTERMEDIATE BROWN COARSE-F SAND w/ GRAEL, TR SILT AND MED-F. BLACK SAND - TAN SAND. MOIST - DRY SP		DECS	
				BOB 7'			

FIELD BORING LOG				BORING NO. Cam. 89-01	
TEST NO.: 6049-04		PROJECT NAME: USATHAMA- BAAP			PAGE 1 OF 1
BORING CONTRACTOR: MATHES		DRILLER: MAJ. TANDIM		DATE STARTED 11/12/89	COMPLETED 11/13/89
METHOD: Hammer	CASING SIZE: 9"	TIP EV: 0.07 2V	PROTECTION LEVEL: 10		
GROUND ELEV.:	SOIL DRILLED: 88.0'	WATER LEVEL: 66.8'	TOTAL DEPTH: 88.0'		
LOGGED BY: NSC		CHECKED BY: P. Bolmer		DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-1	0'-10'			BROWN SANDY SILT MOIST SM	1'/1min	DRILL	
S-2	10'-20'			BROWN-TAN SAND AND SILT, M GRAVEL, BOUNDRS AT 14' AND 17' DR SP	1'/min	DRILL	
S-3	20'-30'			TAN F-SAND F-MED SAND AND GRAVEL, M SILT BOUNDRS AT 24 & 29, DR SP	1'/1.5min	NA	
S-4	30'-40'			TAN F-SAND AND GRAVEL M SILT, BOUNDRS AT 34' DR SP	1'/1.5min	NA	
S-5	40'-50'			TAN F-SAND & GRAVEL M SILT BOUNDRS AT 148' DR SP	1'/2min	NA	
S-6	50'-60'			SAME AS S-5 BOUNDRS AT 151' & 157' SP	1'/2min	NA	
S-7	60'-65'			BROWNISH TAN F SAND AND GRAVEL SP	1'/2min	NA	
S-8	65'-70'			GREY GRAVEL, UNSTABLE, SURE SHALL TH. CONTAIN POSSIBLE BLOCK	1'/4min	NA	
S-9	75'-80'			GREY-BLACK COARSE SAND LUT DETACHED SOFT THIN	DRILL COAT THEN RACK INTO HARD ROCK	NA	
S-10	80'-88'			GREY SANDY LUT, BLACK GRAVEL SIZE PIECE OF SHALE.	1'/5min	NA	

FIELD BORING LOG			BORING NO. ^M 07-89-02	
PROJECT NO.: 6049-04		PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 1
DRILLING CONTRACTOR: MATHES		DRILLER: MA. TINKIN	DATE STARTED 11-7-89	COMPLETED 11-24-89
METHOD: HAND	CASING SIZE: 9"	TIP Ø: 10.02" ✓	PROTECTION LEVEL: 1)	
GROUND ELEV.:	SOIL DRILLED: 113	WATER LEVEL: 97.6	TOTAL DEPTH: 118	
LOGGED BY: NSG		CHECKED BY: P. Bolmer	DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
	0'-10'			BROWN VF SAND, SOME SILT, SOME CLAY, LOESS MOIST - WET SM	ADVANCED QUICKLY 2 1' / 25 min		
	10'-20'			GREYISH-BROWN SILTY CLAY SOFT WET ML	ADVANCED APPROX 1' / 1.5 min		
	20'-30'			LT BROWN SILTY VF SAND MOIST ML	"		
	30'-40'			LT BROWN SILTY VF SAND DRY ML	"		
	40'-60'			LT BROWN-TAN F SAND, SOME SILT, SOME GRAVEL SM	ADVANCED @ 1' / 0.5 min		
	60'-80'			SAME AS ABOVE SM	2 1' / min		
	80'-100'			LT BROWN-TAN F. SAND SOME SILT SOME GRAVEL WET SM P = 97.5	2 1' / 1 min		
	100'-110'			BROWN-TAN SAND AND GRAVEL SP			
	110'-118'			BROWN GRAVEL & SAND (with Boulders) QUARTZITE GRAVEL (BOULDER (MATHES)) QUARTZITE GRAVEL (BOULDER (MATHES))	2 1' / 3 min		

FIELD BORING LOG

BORING NO. OPM-89-02

NO.: 6049-04	PROJECT NAME: USATHAMA-BAAP	PAGE 1 OF 2
CONTRACTOR: MATHES	DRILLER: M. TINNIN	DATE STARTED 10/27/89 COMPLETED 10/1/89
METHOD: ROTARY	CASING SIZE: 9"	TIP Ø: PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED:	WATER LEVEL: TOTAL DEPTH:
LOGGED BY: D. BELAN	CHECKED BY:	DATE: 11/1/89

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
						TIP	LEL
S#1	0-10			GRAY DK BROWN TOPSOIL, GRADING TO BROWN/GRAY SILT (LOESS), DRY-DAMP, TO ~8 FT, W/SOME COLO-BROWN CLAY, SOFT, MOD PLASTIC W LITTLE SAND, DRY, 0 TIP READING 8-10 FT - GRAY CLAY, HIGHLY PLASTIC, DAMP, MOIST, CLEAN, CH-CL		BKGD	
S#2	10-20			GRAY CLAY, MOD HIGHLY PLASTIC, DAMP, CLEAN, CL-CH		0.5 AM	
S#3	20-30			GRAY CLAY, MEDIUM TO DARK, MOD PLASTIC, DAMP, CLEAN, CL TO 24 FT 24-30 FT. MEDIUM BROWN SAND, MEDIUM GRAINED, LOOSE-MED DENSE, POORLY GRADED, NO ODOR, W/LITTLE GRAVEL, SP		1 PM	
S#4	30-40			MEDIUM BROWN SAND, MEDIUM-FINE, LOOSE-DENSE, POORLY GRADED, NO ODOR, W/LITTLE-SOME GRAVEL DRY-DAMP, SP		1 PM	
S#5	40-50		40-42 42-45 45-50	MEDIUM BROWN SAND, MEDIUM-VF, SOME COARSE MP SILTY, WELL GRADED, DAMP, NO ODOR SW SANDY CLAY, SL PLASTIC, DAMP-MOIST, SOME SILT CL W/LITTLE GRAVEL LT BROWN SAND, MED-V FINE, WELL GRADED MOIST-WET, NO ODOR, TRACE GRAVEL SW		BKGD.	
S#6	50-60			LT BROWN SAND, MED-V FINE, SOME SILT, MOIST-WET, WELL GRADED, NO ODOR, SW		BKGD.	
S#7	60-70			LT BROWN SAND, MED-V FINE, SOME SILT, MOIST-WET, WELL GRADED, TRACE GRAVEL SW		BKGD	
S#8	70-80			LT BROWN SAND, MED-V FINE, SILTY MOIST-WET, WELL GRADED, TRACE GRAVEL AND CLAY, SW		BKGD	

BORING NO. OPM-89-02

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S#9	80-90			LT. BROWN SAND, MEDIUM-V FINE, SILTY, MOIST-WET, WELL GRADED, SOME GRAVEL @ 84-85 FT, TRACE FINE GRAVEL THROUGHOUT <u>SW</u>		BKD	
S#10	90-100			LT BROWN SAND, MED-V. FINE, S.A.A. TO 96'		BKGD	
			86-96'	TAN SAND, MEDIUM, DAMP, POORLY GRADED, SP			
			96-100	LT BRN SAND, MEDIUM-FINE-V. FINE, WET, WELL GRADED, SOME GRAVEL, SW		BKD	
S#11	100-110			SAND, S.A.A.		BKGD.	
S#12	110-112.5 113			LT BRN SAND, MED-V. FINE, WET, WELL GRADED, WITH GRAVEL INCREASING TO GREATER THAN HALF SAMPLE.		BKGD.	
				BOB 113 FT. 10/27/89 6 PM			
<p style="text-align: center;">ABANDONED 11/1/89</p>							

FIELD BORING LOG

BORING NO. OPM-89-03

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP	PAGE 1 OF 2
CONTRACTOR: MATHES	DRILLER: MAX THOMAS	DATE STARTED 11-9-89 COMPLETED 11-10-89
METHOD: Hammer	CASING SIZE: 9"	TIP GV: 10.02 eV PROTECTION LEVEL: 0
GROUND ELEV.:	SOIL DRILLED: 168	WATER LEVEL: 149.5 TOTAL DEPTH: 168
LOGGED BY: NSG	CHECKED BY: P. Bolmer	DATE: 11/20/89

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-1	0'-10'			BROWN F. SAND AND SILT, M CLAY, MOIST-WET SM	BORING ADVANCED 2 1/0.5 min	OKGD	
S-2	10'-20'			BROWN F. SAND AND SILT M CLAY MOIST-WET SM		OKGD	
S-3	20'-30'			TAN F. SAND SOME SILT SOME GRAVEL, DRY SM/6M	2 1/0.25 min	OKGD	
S-4	30'-40'			SAME AS S-3 - BOULDER @ 37' SM	2 1/0.5 min	OKGD	
S-5	40'-50'			SAME AS S-3 - BOULDER AT 44' SM	2 1/3 min	OKGD	
S-6	50'-60'			SAME AS S-3 BOULDER AT 52' SM	2 1/3 min	OKGD	
S-7	60'-70'			SAME AS S-3 SM	2 1'/min	OKGD	
S-8	70'-80'			SAME AS S-5 SM	2 1'/min	OKGD	
S-9	80'-90'			TAN F. SAND AND SILT M GRAVEL MOIST SM	1'/min	OKGD	
S-10	90'-100'			SAME AS S-9 SM	1'/min	OKGD	
S-11	100'-110'			TAN F. SAND M SILT M GRAVEL, MOIST-WET SP	1'/1.25 min	OKGD	

FIELD BORING LOG				BORING NO. 00M-89-03	
PROJECT NO.: 6049-04		PROJECT NAME: USATHAMA-BAAP		PAGE 2 OF 2	
DRILLING CONTRACTOR: MATHES		DRILLER: MAX TUNING		DATE STARTED 11-9-89 COMPLETED 11-11-89	
METHOD: HAMMER	CASING SIZE: 9"	TIP ØV: 10.02 EV		PROTECTION LEVEL: D	
GROUND ELEV.:	SOIL DRILLED: 168'	WATER LEVEL: 149.6'		TOTAL DEPTH: 168'	
LOGGED BY: NSC		CHECKED BY: P. Bolmer		DATE: 11-22-89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-12	110'-120'			TAN F. SAND, M GRAVEL, M SILT MOIST-WET SP	1 1/1.25 min	OKGD	
S-13	120'-130'			TAN F. SAND M GRAVEL SP	1 1/25 min	OKGD	
S-14	130'-140'			SAME AS S-13 SP	1 1/1.25 min	OKGD	
S-15	140'-150'			BROWNISH TAN F. SAND M GRAVEL. BOULDER AT 144. MOIST SP	1 1/2 min	OKGD	
S-16	150'-160'			TAN F. SAND M GRAVEL BOULDER AT 150. DRY SP	1 1/2 min	OKGD	
S-17	160'-168'			TAN - GRAVEL, SOME SAND WET 6M	1 1/ min	OKGD	
				BOZ 168'			

FIELD BORING LOG				Boring No. DA39101	
Project No. 685303		Project Name LISATHAMA RAAR		Page 1 of 3	
Contractor MATHESS		Driller T. CRANK		Date started 10/9/91 completed 10/9/91	
Method HSA 4 1/4"		Casing Size —		HNU 11.7/102 #3 Protection Level D	
Ground El.		Soil Drilled 89.5		2' below ground 87 Total Depth 89.5'	
Logged by SANDIN		Checked by DRP		Date 10/11/91	

TIME	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
							HNU	LEL
1800	S-1 A9101002	0-2	15/24/13/7	2.0 1.3	Brown, sandy silty gravelly fill, angular rock fragments	S-1 ANALYTICAL	JAR/JTR	
830	S-2 A9101004	4.5-6.5	1/2/2/3	2.0 1.9	Dark brown v.f. sand with silt/clay, dense dump. SM	S-2 ANALYTICAL	BKG	
835	S-3 A9101011	9.5-11.5	10/26/3/46	1.6 1.6	Light brown f-cse sand with rounded gravel and pebble fragments, loose dry SP	S-3 ANALYTICAL	BKG	
	S-4	14.5-16.5	50/10" 50/5.5"	1.3 0.9	Light brown f-cse sand, loose, dry seemed to have a slight petroleum odor but no response on HNU ambient or jarred headspace sample SP	S-4 Ref	BKG BKG	
845	S-5 A9101021	19.5-21.5	20/37/ 31/46	2.0 1.5	Light brown SAND fine-med with some coarse and rounded gravel, loose, dry, well graded SP	S-5 ANALYTICAL	BKG	
	S-6	24.5-26.5	15/23/ 30/34	2.0 2.0	24.5-25.1 sand m-cse with 40% rounded gravel loose dry SP 25.1-26.5 sand tan, generally fine with 5% med-cse silt and 5-10% gravel, loose dry	S-6 REF	BKG	

FIELD BORING LOG				Boring No. 0A39	
Project No 685303		Project Name LISATHAMA BAAP		Page 2 of 3	
Contractor MATHES		Driller T. CRANK		Date started 10-9-91 completed 10-11-91	
Method HSA 4" ID		Casing Size —	HNU 11.7(10.2) #3	Protection Level D	
Ground EL		Soil Drilled 89.5	± below ground 87	Total Depth 89.5'	
Logged by SANDIN		Checked by DRP		Date 10/11/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-7	29.5 - 31.5	15/36 / 32/31	2/0	LOST SPOON SHOE IN HOLE. NO RECOVERY	Reference	JAR/ATP	
S-8	39.5 - 41.5	20/21 / 22/35	2.0 / 2.0	Tan Sand Fine poorly graded with trace med - coarse rounded grains and 5-15% fine-med rounded gravel. loose, dry. SP	Reference	OK	OK
S-9	49.5 - 51.5	10/26 / 37/38	2.0 / 2.0	TAN SAND Fine grained poorly graded 50.0 - 50.2 Fine sand with rounded fine gravel loose, dry. SP	Reference	OK	OK
S-10	59.5 - 61.5	14/40 / 45/50 for 10"	1.9 / 1.9	TAN SAND fine poorly graded with trace fine rounded gravel SP	Reference	OK	OK
S-11	69.5 - 71.5	14/31 / 45/46	2.0 / 2.0	TAN SAND fine grained very well sorted, trace gravel. SP	Reference	OK	OK
S-12	79.5 - 80.5	redo fell and drive spoon 1st try 15/39/50	2.0 / 1.8	TAN SAND fine, well sorted with occasional fine to medium zones. clear rounded quartz grains. SP	Reference	OK	OK

FIELD BORING LOG				Boring No. 0AB9101	
Project No 685303		Project Name USATHAMA BAAP		Page 3 of 3	
Contractor MATHES		Driller T. CRANK		Date started 10-9-91 completed 10-9-91	
Method HSA 4 1/4-10		Casing Size —		HNU 11.7 (10.2) #3	
Ground El		Soil Drilled 89.5		Protection Level D	
		2' below ground 87		Total Depth 89.5	
Logged by SANDIN		Checked by DRP		Date 10/11/91	

Time

1200

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-13	84.5 - 86.5	15/28 / 30/37	2.0 / 2.0	Tan sand fine v. well sorted. damp. SP	Reference	JAR S/G	ATR S/G
S-14 A9101091	89.5 - 91.5	4/5/14 / 36	2.0 / 2.0	TAN SAND fine to medium with trace fine gravel saturated, loose, SP Water measured in augers 87.0' b.g.s. BOB 89.5 HSA 91.5 1st s.spoon	Analytical		S/G

FIELD BORING LOG				Boring No. CAB-91	
Project No 6853-03		Project Name BAAP		Page 1 of 3	
Contractor MATHES		Driller Kevin Brinkman		Date started 10-9-91 completed 10-9-91	
Method HSA/8-75		Casing Size 4.25" ID		HNU 11.7 (10.2)	
Ground EL		Soil Drilled 90'		Protection Level D	
Logged by RHA.		Checked by DRP		Date 10/10/91	

	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		HEAD S. G.
							HNU	LEL	
08:10	S-1 A9102002	0-2'	6/7/14/12	24' 24"	Brown fine Sand; little silt; trace clay and fine gravel; dry. (fill) SM ^{to comp} SM	3kg = background 1 ppm. (HNU - 10.250 probe) S-1: Analytical	DRP ^{STAT} STAT ^{STAT}	NAB	0.5
08:20	S-2 H102007	5-7'	3/5/3/6	2.0/ 1.5	Brown fine Sand; little silt and medium sand; trace clay and fine to medium rounded gravel. dry. SM.	S-2: Analytical	DRP ^{NAB}		0.5
08:30	S-3 A9102012	10- 11.5 12.0	5/13/20/23	1.5/ 2.0 1.5	Bottom 1.2' - Brown to tan fine sand; trace fine to medium gravel; dry ^{SP} Top. 0.3' Brown clay, moist, soft. trace silt and fine sand. SC	Drillers over-driving split spoon RHA requests not to do so. S-3: Analytical	DRP ^{Bkg}		0.5
09:10	S-4	1 5-17 15-16.5	30/58/50	1.5/ 13	Tan fine and medium Sand; Little coarse to fine rounded gravel; trace coarse sand; SM SM dry.	S-4: Reference	DRP ^{Bkg}		0.5

* NAB = NOT above background.

FIELD BORING LOG				Boring No. 04B-91-02	
Project No 6853-03		Project Name RAAP		Page 2 of 3	
Contractor MATHEIS		Driller KATH Buehner		Date started 10-9-91 completed 10-9-91	
Method HSA/3-75		Casing Size 4.25" I.D.		HNU 11.7 (102)	
Ground El		Soil Drilled 90'		Protection Level D	
		2' below ground		Total Depth 92'	
Logged by RWA		Checked by DRP		Date 10/10/91	

	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		HEAD SPALL
							HNU	LEL	
09:15	S-5 29102022	20-22'	7/15/24/26	2.0/ 2.0	Tan medium Sand; little fine sand; trace coarse sand and medium gravel; dry. SP (Peppered with red and black minerals)	S-5: Analytical	BLK ATR	BLK	BLK
09:40	S-6	25-26.5'	6/16/21		Tan medium Sand, peppered w/brown/red sand; trace fine and coarse Sand and fine to medium rounded gravel; dry. SP	S-6: Reference	BLK	BLK	BLK
10:00	S-7	30-31'	53/100	11"/ 10"	Tan to Brown medium Sand; some coarse Sand and fine gravel; little medium gravel and fine sand; dry. SW.	Refused at 100 Blow Counts. S-7: Reference	BLK	BLK	O.C.
10:15	S-8	40-42'	16/23/29	1.5/ 1.5	Tan medium Sand; little coarse sand; trace fine to medium gravel - angular to subrounded; dry. SP	S-8: Reference	BLK	BLK	BLK
01:30	S-9	50-52'	15/34/3/55	2.0/ 2.0	Tan fine Sand; trace coarse sand and fine to med. subrounded gravel; dry. SP	S-9: Reference	BLK	BLK	BLK
11:00	S-10	60-62'	23/43/4/52	2.5/ 1.5	Tan fine Sand; trace coarse sand and fine rounded gravel; dry. SP.	88" split spoon not driven 6-inches. S-10: Reference	BLK	BLK	BLK

FIELD BORING LOG				Boring No. 0A3-91-	
Project No 6853-03		Project Name BAAP		Page 3 of 3	
Contractor MATHEIS		Driller Keith		Date started 10-9-91 completed 10-9-91	
Method HSA/KMR 75		Casing Size 4.25" I.D.		HNU 11.7 (10.2)	
Ground El		Soil Drilled 90'		Protection Level D	
		2' below ground 91'		Total Depth 92'	
Logged by RHA		Checked by DRP		Date 10-10-91	

	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		
							HNU	LEL	
11:30	S-11	70-72	8/17/24/35	2.4/ 2.0	Ten fine Sand; trace medium Sand and fine rounded gravel; dry. SP	S-11: Reference	Bl ₁	Bl ₂	Bl ₃
12:15	S-12	80-81.5	10/16/38	1.5/ 1.5	Ten fine Sand; trace medium Sand; dry. SP	S-12: Reference	Bl ₁	Bl ₂	Bl ₃
13:30	S-13 A9162092	90- 92	28/4/0/1	2.0/ 0.7	Ten fine Sand; trace medium and coarse sand; wet	S-13: Analytical + using down-hole hammer - would not tell how many blows could was used to drive down. Measured DWT w/ electronic tape - bottom of boring is dry, but the rats tail is filled with water. T.D. 92'	Bl ₁	Bl ₂	Bl ₃

FIELD BORING LOG				Boring No. CAB9103	
Project No. 685303		Project Name USATHAMA BAAP		Page 1 of 3	
Contractor MATHES		Driller T. CRANK		Date started 10.16.91 completed 10.16.91	
Method HSA 4 1/4"		Casing Size —		HNU 11.7(10.2) #3 Protection Level D	
Ground El.		Soil Drilled 8'9"		2' below ground 8'6.5" Total Depth 9'1"	
Logged by E. SANDIN		Checked by DRP		Date 10/16/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-1	0-2	9/9/8/9	2.0 1.8	brown sandy gravelly fill, loose, dry from 0-0.5. 0.5-1.8 dark brown silt, stiff, dense, very slightly plastic	ANALYTICAL SAMPLE A9103002	JAR ATK B/Ks B/Ks	21.0
S-2	4-6	3/5/6/7	2.0 1.8	brown silty clay moderately plastic grading to light brown wet fine sand well sorted.	ANALYTICAL SAMPLE A9103006	B/Ks B/Ks	
S-3	9-11	weight of hammer 13/7/9	2.0 1.7	sandy silt, brown, wet from 9-9.3 9.3-10.1 brown silty sand, wet, rounded gravel, stiff at bottom 10.1-10.7 tan fine sand, well-sorted dry	ANALYTICAL SAMPLE A9103011	B/Ks B/Ks	
S-4	14-16	15/25/ 33/25	2.0 2.0	14-15.1 tan sand fine well sorted dry 15.1-16 tan gravelly sand, loose dry	Reference Sample		

FIELD BORING LOG				Boring No. 04871	
Project No. 65302		Project Name USATHAMA BAAP		Page 2 of 3	
Contractor MATHES		Driller T. CRANE		Date started 10-16-91 completed 10-16-91	
Method HSA 4 1/4"		Casing Size —		HNU 11.2/10.2 3 Protection Level D	
Ground EL		Soil Drilled 89		2' below ground 86.5 Total Depth 91	
Logged by F. SANDEN		Checked by DRP		Date 10/16/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen HSC	Description	Comments on Advance of Boring	Monitoring	
						HNU	LE
S-5	19-21	5/20/35/ SD 4"	2.0 1.7	light brown sand Fine to coarse with trace rounded gravel moist, loose	ANALYTICAL SAMPLE 09103021	OK	2' unit
S-6	24-26	12/28 43/45	2.0 2.0	tan to brown gravelly sand, fine to coarse with 30% rounded gravel	Reference Sample	OK	OK
S-7	29-31	21/21/ 21/38	2.0 1.8	tan sand, fine, well sorted, loose grading to fine to coarse with small gravel, loose, dry	Reference Sample	OK	OK
S-8	39-41	12/17/ 30/40	2.0 2.0	sand tan fine well sorted occasionally fine to medium well sorted, trace gravel, loose, moist	Reference Sample	OK	OK

FIELD BORING LOG				Boring No. 0AB9103	
Project No. 685303		Project Name USATHAM BAAP		Page 3 of 3	
Contractor MATHES		Driller T. CRANK		Date started 10.16.91 completed 10.16.91	
Method HSA 4 1/4"		Casing Size —		HNU 11.7(10.2) #3 Protection Level D	
Ground El.		Soil Drilled 89		# below ground 86.5 Total Depth 91	
Logged by E. SANDIN		Checked by DRP		Date 10/16/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-9	49-51	15/35 37/50	2.0 2.0	tan sand fine, well sorted, slightly moist. occasional med to coarse layers 0.01 - 0.03 thick	Reference Sample	OK	OK
S-10	59-61	11/23 36/50	2.0 2.0	tan sand fine with trace gravel similar to S-9	Reference Sample	OK	OK
S-11	69-71	13/25/33 48	2.0 2.0	tan sand, fine well sorted, occasional medium sand layering, no gravel, moist base	Reference Sample	OK	OK
S-12	79-81	16/30/ 36/43	2.0 2.0	tan sand fine well sorted, damp to coarse sand to fine gravel	Reference Sample	OK	OK
S-13	89-91	4/8/ 13/25	2.0 2.0	tan sand, fine well sorted, trace coarse, trace gravel, base wet, BOB 89 AUGERS 91 SPOON	Analytical Sample A9103091	OK	OK

FIELD BORING LOG				BORING NO. CA589CI	
PROJECT NO.: 6049- C4		PROJECT NAME: USATHAMA- BAAP			PAGE 1 OF 5
DRILLING CONTRACTOR: MATHES		DRILLER: Ed Clark		DATE STARTED 10-17-89	COMPLETED 10-17-89
METHOD: HSA	CASING SIZE: 4.25 ID	TIP W: 10.6	PROTECTION LEVEL: Mod D		
GROUND ELEV.:	SOIL DRILLED: 92'	WATER LEVEL: 88.3	TOTAL DEPTH: 92.0		
LOGGED BY: D LARUE		CHECKED BY: P. Bolmer		DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-1 AB901000	0-2	10/10/8/9	$\frac{2.0}{1.6}$	Dark brown gravelly silty. Low plasticity. loose, damp. Mottling pH-6 (GM)	S-1 Analytical	$\frac{-2}{-2}$	2.1
S-2 AB901005	5-7'	4/7/7/9	$\frac{2.0}{1.5}$	Dark brown silty clay. trace gravel. moderate plasticity, loose, damp. (CL) pH-6	S-2 Analytical	$\frac{-2}{-2}$	
S-3 AB901010	10-12'	13/30/33	$\frac{1.5}{1.2}$	Tan to med. brown gravelly sand (gravel size up to 3") Sand is med. gr, poorly sorted, dense, damp, no plast. pH-6 (SW) *change between 7-10.	S-3 Analytical	$\frac{-2}{-3}$	
S-4 Reference	15-17'	4/16/30/32	$\frac{2.0}{1.8}$	15.0 to 15.1: med. brown gravelly sand (poorly sorted, damp mottled, no plast. dense) 15.1 to 16.0: med. gr. clean tan sand (well sorted, damp, no plast. trace heavy mineral) 16.0-17.0: med. brown, med grained gravelly sand. No plast, poorly sorted, dense, damp. (Gravel size .1" to 3") pH-6 (SW/SP)	Reference sample	$\frac{-2}{-2.5}$	

FIELD BORING LOG

BORING NO. CABE951

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP	PAGE 2 OF 5
DRILLING CONTRACTOR: MATHES	DRILLER: Ed Clark	DATE STARTED 10-17-89 COMPLETED 10-17-89
METHOD: HSA	CASING SIZE: 4.25 ID	TIP Ø: 10.6
GROUND ELEV.:	SOIL DRILLED: 92.0'	PROTECTION LEVEL: Mod. D
	WATER LEVEL: 65.3'	TOTAL DEPTH: 92.0'
LOGGED BY: D. LaRue	CHECKED BY: P. Bolmer	DATE: 11/20/89

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-5 AS9C1020	20-22	15/41/24/27	$\frac{2.0}{2.0}$	Med brown to tan, med gr. gravelly sand. No plas, poorly sorted, dense, dry to damp. Trace lens of med. gr. clean sand. PH-6 (sw)	S4 Analytical	-7/2	8
S-6 Reference	25-27	15/16/28/40	$\frac{2.0}{1.7}$	Med. brown, med gr. gravelly sand (lg. gravel) (poorly sorted, no plasticity, dense, damp to moist) grading to tan, med to fine gr. gravelly sand (small size gravel - 1/2") (poorly sorted, no plas, dense, damp) Trace heavy mineral. (sw) PH-6	Reference sample	-4.3	-4
S-7 Reference	30-32	13/30/33/56	$\frac{2.0}{2.0}$	<u>30-31</u> Med. br., med gr. gravelly sand. No plas, poorly sorted, damp, dense. <u>31-31.6</u> : Tan, med. gr. clean sand, trace gravel. Mod. to good sorting, no plasticity, dense, damp. * See "varied" sequence of silty sand in this	Reference sample	-4	-4

FIELD BORING LOG				BORING NO. CABE701	
PROJECT NO.: 6049-04		PROJECT NAME: USATHANA- BAAP			PAGE 3 OF 5
DRILLING CONTRACTOR: MATHES		DRILLER: Ed Clark		DATE STARTED: 10-17-89	COMPLETED: 10-17-89
METHOD: HSA	CASING SIZE: 4.25 ID	TIP GV: 10.6	PROTECTION LEVEL: Med. D		
GROUND ELEV.:	SOIL DRILLED: 92'	WATER LEVEL: 85.3'	TOTAL DEPTH: 92'		
LOGGED BY: D. LaRue		CHECKED BY: P. Bolmer		DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
	30 - 32 cont'd			intercal. 1/4" apart, 2mm size 3.6 to 38.0 med. gr. tan sand, med. sorting, dense, damp. pH-6 (SW/SP)			21
S-8 Reference	40 - 42	14/25/30/42	2.0 2.0	Tan, med. gr. gravelly sand. Poorly sorted, no plas, dense, damp. Some mottling. Gravel is dominant thru first 6"; then grades to much smaller amt & size (1/4", about 10%) (SW) pH-6	Reference sample	3 -3	
S-9 Reference	50 - 52'	15/26/30/29	2.0 2.0	Alternating layers of med. gr. gravelly sand (Poor sorting, no plas. dense, dry) with tan. med. gr., fine gr. clean sand. (well sorted, no plas, dense, damp. light mottling) (SW/SP) pH-6	Reference sample	3 -3	

FIELD BORING LOG

BORING NO. CABE-901

PROJECT NO.: 6049-04

PROJECT NAME: USATHAMA-BAAP

PAGE 4 OF 5

DRILLING CONTRACTOR: MATHES

DRILLER: Ed Clark

DATE STARTED 10-17-89

COMPLETED 10-22-89

METHOD: HSA

CASING SIZE: 4.25 ID

TIP Ø: 10.6

PROTECTION LEVEL: Med. D

GROUND ELEV.:

SOIL DRILLED: 92'

WATER LEVEL: 85.3'

TOTAL DEPTH: 92'

LOGGED BY: D LaRue

CHECKED BY: P. Bolmer

DATE: 11/20/89

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-10 Reference	60-62	11/28/34/37	2.0 2.0	Tan. med. gr. clean sand. Trace gravel well sorted, no plant, dense, damp to dry. Couple lens' of med. gr. gravelly sand. Few med. br. silty sand layers (~2mm thick). Sample is damp to moist directly underneath these layers. (SW) pH-6	Reference Sample	-3 -1.3	21
S-11 Reference	70-92	10/29/35/38	2.0 2.0	Tan. med. gr. clean sand. Trace gravel, well sorted no plant, dense, damp. Dk. brown sandy silt layers as before (~2mm) slight mottling. (SP) pH-6	Reference Sample	-3 -3	
S-12 Reference	80-82	12/25/43/49	2.0 2.0	Tan. med. gr. clean sand. Med. to well sorted. Trace gravel. Non plastic, dense dry to damp. Some mottling. Trace heavy mineral. (SP) pH-6	Reference Sample	-3 -3	

FIELD BORING LOG				BORING NO. CAFE-01	
PROJECT NO.: 6049-04		PROJECT NAME: USATHAMA-BAAP		PAGE 5 OF 5	
DRILLING CONTRACTOR: MATHES		DRILLER: Ed. Clark		DATE STARTED 10-17-89 COMPLETED 11-17-89	
METHOD: HSA	CASING SIZE: 4.25 ID	TIP ØV: 10.6		PROTECTION LEVEL: NCD D	
GROUND ELEV.:	SOIL DRILLED: 92.0'	WATER LEVEL: 90.0'		TOTAL DEPTH: 92.0	
LOGGED BY: D. LaRue		CHECKED BY: P. Bolmer		DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-13 AB901090	90-92	17/431.	$\frac{2.0}{1.1}$	Tan. med. gr. sand well sorted, trace heavy mineral, trace gravels. No plasticity, dense, saturated. pH-6 (SP) * hit water at 90'.	S-S Analytical	$\frac{-3}{-3}$	Z1
				T.D. @ 92'			

FIELD BORING LOG				BORING NO. OAB-59-02	
PROJECT NO.: 6049- 64		PROJECT NAME: USATHAMA- BAAP		PAGE 1 OF 3	
DRILLING CONTRACTOR: MATHES		DRILLER: Ed		DATE STARTED 10/23/89 COMPLETED 10/24/89	
METHOD: CMF-75		CASING SIZE: 4 1/4" ID		TIP cv: #11 10.6 PROTECTION LEVEL: 0	
GROUND ELEV.:		SOIL DRILLED: 102		WATER LEVEL: 91.2 TOTAL DEPTH: 102	
LOGGED BY: Briss/Gluckberg		CHECKED BY: P. Bolmer		DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-1	0-2	134 5	17/24	light brown med Sn Sand and angular gravel dry-moist. grading to dark brown silt wt gravel. FILL sm	Bkgd background = 0-5ppm.	Bkgd	
S-2	5-7	5577	15/24	light brown med-fine SAND wt little silt and occas. gravel angular Fill moist-wet sm		Bkgd	
S-3	10-12	1012427	14/24	light brown med-fine SAND wt little silt and occas. gravel iron staining, dark brown to black silt/clay, Plastic at 11.5-12 ft. sm-ML FILL	FILL	Bkgd	
S-4	15-17	20365055	18/24	light brown coarse-fine SAND and GRAVEL dry-moist glaciolacustrine ss-sp	Native Soil.	Bkgd	
S-5	20-22	381724	20/24	tan medium fine SAND dry moist, Brown gravelly layer at 21.5 ft. glaciolacustrine ss-sp		Bkgd	

FIELD BORING LOG				BORING NO. 0 AB-89-	
PROJECT NO.: 6049-04		PROJECT NAME: USATHAMA-BAAP		PAGE 2 OF 3	
DRILLING CONTRACTOR: MATHES		DRILLER: Ed Clark		DATE STARTED 10/23/89 COMPLETED 10/24/89	
METHOD: Augers		CASING SIZE: 4 1/4" ID		TIP cv: #11 0.6 PROTECTION LEVEL: D	
GROUND ELEV.:		SOIL DRILLED: 102		WATER LEVEL: 91.2 TOTAL DEPTH: 102	
LOGGED BY: Buss/Gluckenberg		CHECKED BY: P. Bolmer		DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S#6	25-27 25-27 30-32 JAB	6 10 19 26	14 24	Similar to S#5 S SM-SP		Bkgd	
S#7	JAB 25-27 30-32 30-32	15 26 32 57	20 24	brown crse - fine sand w/ subang. to rounded gravel glacio fluvial SP		Bkgd	
S#8	40-42 50-52 JAB	12 19 26 32	22 24	Tan fine-med sand w/ layered fine-med sand + crse sand zones. SM		Bkgd	
S#9	50-52 60-62 JAB	10 20 23 30	19 24	Tan Med-fine SAND w/ minor stratified zones occasional gravel. SM		Bkgd	
S#10	60-62 70-72 JAB	15 32 44 51	17 24	70-71 tan Med-fine SAND w/ coarse sand + gravel at 71 ft dark med fine sand w/ crse sand below 71 ft dry/moist SM-SP		Bkgd	

FIELD BORING LOG

BORING NO. OAB-89-02

JECT NO.: 6049-04

PROJECT NAME: USATHAMA- BAAP

PAGE 3 OF 3

DRILLING CONTRACTOR: MATHES

DRILLER: Ed Clark

DATE STARTED 10/23/89

COMPLETED 10/24/89

METHOD: Augers

CASING SIZE: 4 1/4" ID

TIP #V: #11 106

PROTECTION LEVEL: D

GROUND ELEV.:

SOIL DRILLED: 102 ft

WATER LEVEL: 91.2 ft BGS

TOTAL DEPTH: 102 ft

LOGGED BY: Bing/Chickberg

CHECKED BY: P. Bolner

DATE: 11/20/89

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S#11	JAB 80-82 70-72	9 19 26 31	20 24	Similar to S#9 wt layered massic sands v. thin dry-moist. SM	easy drilling	Bkgd.	
S#12	JAB 80-82 90-92	8 18 26 42	18 24	Similar to S#11 possible X bedding. moist-dry SM	10/23/89 10/24/89	Bkgd	
S#13	90-92	7 21 26 62	18 24	light brown med. sn SAND coarse sand at 91.6 to 91.7 ft. wet SR pH = 6	easy drilling	Bkgd	
S#14	100-102	4 6 17 29	18 24	similar to S#13 no med-crse sand layers, no stratification. SR WL = 91.2' BGS 102 ft = BOE.	smooth drilling below WT, only w/ft heave into augers.	Bkgd.	

FIELD BORING LOG

BORING NO. GAB-8903

PROJECT NO.: 6049-04	PROJECT NAME: USATHAMA- BAAP	PAGE 1 OF 5
DRILLING CONTRACTOR: MATHES	DRILLER: Ed Clark	DATE STARTED 10-16-89 COMPLETED 10-17-89
METHOD: HSA	CASING SIZE: 4.25 ID	TIP EV: 10.6 PROTECTION LEVEL: MOD D
GROUND ELEV.:	SOIL DRILLED: 97'	WATER LEVEL: 90' TOTAL DEPTH: 97'
LOGGED BY: D. LaRue	CHECKED BY: P. Bolmer	DATE: 11/20/89

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-1 A8903000	0-2'	2/4/6/7	$\frac{2.0}{1.4}$	Top 6" dark brown sandy gravel. Surface material grades to dark brown gravelly silt matting. Poorly sorted, damp, mod. plasticity, loose. (GM) pH-6	S-1 Analytical	$\frac{-2}{-2}$	21
S-2 A8903005	5-7'	4/4/7/7	$\frac{2.0}{1.4}$	Dark to med. brown sandy silt. Gravel in the top 1". Some matting. Mod. plasticity, loose, poorly sorted, damp to moist. Grades to fine silty sand at base. (SM) pH-6	S-2 Analytical	$\frac{-2}{-2}$	
S-3 A8903010	10-12'	6/11/22	$\frac{1.5}{1.5}$	Top 6" grades from tan, fine gr. gravelly sand to dark brown silty sand. No plas, damp. At 11.0: med. gr. tan sand with trace gravel. No plas. dry to damp, poor sorting med. dense. (GP) pH-7 *change at 10.0' *change at 11.0'	S-3 Analytical	$\frac{-2}{-2}$	

FIELD BORING LOG

BORING NO. 0ABE903

PROJECT NO.: 6049-04		PROJECT NAME: USATHAMA- BAAP		PAGE 2 OF 5	
DRILLING CONTRACTOR: MATHES		DRILLER: Ed Clark		DATE STARTED 10-16-89 COMPLETED 10-17-89	
METHOD: HSA	CASING SIZE: 4.25 ID	TIP ØV: 10.6		PROTECTION LEVEL: Mod D	
GROUND ELEV.:	SOIL DRILLED: 97'	WATER LEVEL: 90.0'		TOTAL DEPTH: 97'	
LOGGED BY: D. LaRue		CHECKED BY: P. Bolmer		DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-4 Reference	15-17	7/28/32/30	$\frac{2.0}{1.9}$	Med. brown to tan, med. gr. gravelly sand. Poorly sorted, no plasticity damp dense. Mottled. A couple tan, clean med. gr. sand lens. Well sorted, damp. (SP/GP) pH-6	Reference sample	$\frac{-2.0}{2.0}$	
S-5 3020	20-22	18/24/30/40	$\frac{2.4}{1.6}$	<p>TO 21.0: Med. brown, med. gr. gravelly sand. (Gravel up to 3" size) Poorly sorted, no plast., dense, damp.</p> <p>TO 22.0: Tan, med to fine gr clean sand. Well sorted. No plas., dense, dry to damp. Trace heavy mineral. (SW/SP) pH-6</p> <p>+ change at 21.0</p>	3-4 Analytical	$\frac{-2.4}{2.0}$	
S-6 Reference	25-27	13/41/45/42	$\frac{2.0}{1.8}$	med brown to tan, med. gr. gravelly sand. (gravel ~30%, size 1/4") Poorly sorted, no plast., dense, damp. Mottled (SW) pH-6 + change between 22' & 25'	Reference sample	$\frac{-2}{2}$	

FIELD BORING LOG				BORING NO. 0P58903	
PROJECT NO.: 6049- 04		PROJECT NAME: USATHAMA- BAAP		PAGE 3 OF 5	
DRILLING CONTRACTOR: MATHES		DRILLER: Ed Clark		DATE STARTED 10-16-89 COMPLETED 10-17-89	
METHOD: HSA	CASING SIZE: 4.25 ID	TIP øV: 10.6	PROTECTION LEVEL: Mod D		
GROUND ELEV.:	SOIL DRILLED: 97'	WATER LEVEL: 90.0'	TOTAL DEPTH: 97.0'		
LOGGED BY: D. LaRue		CHECKED BY: P. Palmer		DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-7 Reference	30-32	16/27/33/26	$\frac{2.0}{2.0}$	Alternating layers of tan med. gr. gravelly sand. (Poorly sorted, dense, nonplastic, damp) with tan. clean, med to fine gr. sand. (well sorted no plasticity, dense, damp. Mottling. (SP/SW) pH-6	Reference sample	$\frac{-2}{-2}$	21
S-8 Reference	40-42	10/23/40/47	$\frac{2.0}{2.0}$	Tan, med. gr. gravelly sand. Poorly sorted, no plas., dense, damp. Mottling. Very small (~2mm) silty sand layers located in the well sorted sand. Layers are approx 1/4" apart consist. (varved appearance) (GH) pH-6	Reference sample	$\frac{-2.0}{-1.5}$	
S-9 Reference	60-62	12/20/27/35	$\frac{2.0}{2.0}$	Top 2": Tan, med. gr. gravelly sand. Poorly sorted, no plasticity, dense, damp. Next 1": Tan, med. gr. sand (trace gravel) med. sorting no plasticity, dense, damp. At 51.2: med. brown, very fine gr. sand lens, 2"	Reference sample	$\frac{-2}{-2}$	

FIELD BORING LOG

BORING NO. 0AB8903

PROJECT NO.: 6049-04		PROJECT NAME: USATHAMA- BAAP		PAGE 4 OF 5	
DRILLING CONTRACTOR: MATHES		DRILLER: Ed Clark		DATE STARTED 10-16-89 COMPLETED 10-17-89	
METHOD: HSA	CASING SIZE: 4.25 ID	TIP cv: 10.6	PROTECTION LEVEL: Mod. D		
GROUND ELEV.:	SOIL DRILLED: 97'	WATER LEVEL: 90.0'	TOTAL DEPTH: 97.0'		
LOGGED BY: D. LaBue		CHECKED BY: P. Bolmer		DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
				thick. No plasticity, very well sorted, dense, damp. 51.4 to 52.0 grades from tan very fine grained sand to tan, gravelly sand, med. gr. Poorly sorted, no plasticity, dense, damp. (SW) pH-6			31
0 Reference	60-62	17/25/35/55	$\frac{2.0}{2.0}$	Tan, med. gr. gravelly sand layers alternating with layers of tan, med gr. clean sand. No plasticity, damp, dense. Gravelly sands are poorly sorted, med. clean sands are well sorted. Slight matting. (GP/SP) pH-6	Reference Sample	$\frac{-2}{-1.3}$	
S-11 Reference	70-72	16/24/47/59	$\frac{2.0}{2.0}$	Tan, med. gr. sand. Trace gravel. Moderate sorting, no plasticity, dense, damp to moist. (SP) pH-6	Reference Sample	$\frac{-2}{-1.4}$	

FIELD BORING LOG				BORING NO. CAB8903	
PROJECT NO.: 6049-04		PROJECT NAME: USATHAMA-BAAP			PAGE 5 OF 5
DRILLING CONTRACTOR: MATHES		DRILLER: Ed Clark		DATE STARTED 10-16-89	COMPLETED 10-17-89
METHOD: HSA	CASING SIZE: 4.25 ID	TIP Ø: 10.6		PROTECTION LEVEL: Mod D	
GROUND ELEV.:	SOIL DRILLED: 97.0'	WATER LEVEL: 90.0'		TOTAL DEPTH: 97.0'	
LOGGED BY: D. LaRue		CHECKED BY: P. Bolmer		DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-12 Reference	80-82	14/35/50/51	$\frac{2.0}{2.0}$	Alternating layers of tan, med. gr. gravelly sand (poorly sorted, no plasticity, dense, damp) with tan, med. to fine gr. clean sand (well sorted, no plasticity, dense, damp.) Some med bl. silty sand layers (1-2mm) in the clean sand. (GP/SP) pH-6	Reference sample	$\frac{2.0}{1.0}$	21
S-13 AS903090	90-92	6/13/25/40	$\frac{2.0}{1.6}$	Tan, med. gr. sand. Trace gravel. Moderate sorting, no plasticity, dense, saturated. pH-6 (SP) *Hit water at 90'	S-5 Analytical	$\frac{-2}{-1.5}$	
S-14 Reference	45-97	6/10/18/32	$\frac{2.0}{1.8}$	Tan, med gr sand. Well sorted, no plas, dense saturated. (SP) pH-6 T.D. 97'	Reference	$\frac{-2}{-2}$	

FIELD BORING LOG				Boring No. 04M-91-01	
Project No. 06853-03		Project Name BARBER AAP		Page 1 of 1	
Contractor LAYNE		Driller G. RODRIGUEZ		Date started 10-27-91 completed 10-27-91	
Method DUAL WALL		Casing Size 9" O.D.	MNU 11.7/10.2	Protection Level D	
Ground El.		Soil Drilled 100'	± below ground 82.5'	Total Depth 100'	
Logged by RRR		Checked by DRP		Date 10/30/91	

fpm

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		
						MNU	LEL	
S-1	0-10'			BROWN SILTY SAND, WLD, F, SOME M, TR C COHESIVE, DAMP	(SM)	JAR	ATR	0
S-2	10-20'			LT BROWN SAND, WLD, M-C, LITTLE F, LITTLE F GRAV, TR COBBLES	(SW)	0	4	0
S-3	20-30'			- SAME AS S-2	(SW)	0	14	0
S-4	30-40'			- SAME AS S-2	(SW)	0	0	0
S-5	40-50'			LT BROWN SAND, PWD, MODERATELY GRADED, M, LITTLE F, LITTLE C, TR COBBLES	(SP)	0	0	0
S-6	50-60'			LT BROWN SAND, WLD, M, LITTLE F, SOME C, LITTLE F GRAV	(SW)	0	0	0
S-7	60-70'			SAME AS S-6	(SW)	0	0	0
S-8	70-80'			SAME AS S-6	(SW)	0	0	0
S-9	80-90'			LT BROWN SAND, PWD, M, LITTLE C, TR F GRAV, TR F SAND	(SP) 82.5'	0	0	0
S-10	90-100'	90-93		LT BROWN SAND, WLD, M, SOME C, LITTLE - SOME F GRAV.	(SW)	0	0	0
		93-100		BROWN SAND, PWD, F, LITTLE M, TR SILT	(SP)			
				100' = B.O.E.				

FIELD BORING LOG				Boring No. FTB-9	
Project No. 69S3-03		Project Name BAAP		Page 1 of 3	
Contractor MATHE'S		Driver KEN BURKIN		Date started 10/22/91 completed 10/22/91	
Method HSA	Casing Size 4 1/4" ID	HNU 11.7/10.2	Protection Level D		
Ground El	Soil Drilled 90'	± below ground	Total Depth 92'		
Logged by W. HILDS		Checked by DRP	Date 10/22/91		

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-1	0-2'	3-5-5-7	18" 24"	0-3 light brown silty SAND wet some gravel, well graded, non-plastic loose (FILL) 0.3-2.0	Original	JAR	ATK
S-2	5-7'	5-6-2-8	2.0	Dark brown fine sand silt Some fine gravel, well-graded non-plastic, loose, dry (FILL)	Analytical		
S-2	5-7'	5-6-7-8	2.0 2.0	0.0-0.8' Black fine Sandy SILT, well graded, slightly plastic, medium dense, oil stained with fuel oil odor 0.8'-2.0' light brown silt, well graded, slightly plastic, medium dense	Analytical	20	17
S-3	10-12'	2-4-4-6	1.2 2.0	Brown fine sand with occasional SILT layers, well graded, non-plastic sandy slightly plastic silt, loose, stratified, some sporadic oil staining	Analytical	1.0	Blk

FIELD BORING LOG				Boring No. FTB-91-01	
Project No. <u>683-03</u>		Project Name <u>USATHAMA - BAP</u>		Page <u>2</u> of <u>3</u>	
Contractor <u>MATRES</u>		Driller <u>K. Bunse Meyer</u>		Date started <u>10/22/91</u> completed <u>10/22/91</u>	
Method <u>MTSA</u>		Casing Size <u>4 1/4" ID</u>		HNW <u>11.7/10.2</u>	
Ground El.		Soil Drilled <u>90'</u>		Protection Level <u>D</u>	
Logged by <u>W.H.H.D.S.</u>		Checked by <u>DRP</u>		Date <u>10/22/91</u>	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNW	LEL
S-4	15-17'	9-17-45-50	2.0 2.0	Light brown fine sand and gravel, some to little medium sand, well-graded, non-plastic, very dense, dry, with light brown fine sand layer 0.6-1.0'	Artificial	JAR 25 5246	ATR
S-5	20-20.9'	33-100/50	0.9' 0.9'	Same as S-4, cobble fragment in spoon-tip	Reference	25 324	
S-6	25-27'	14-20-20-30	2.0 2.0	Tan fine to medium SAND with some coarse sand and fine gravel strata, occasional coarse subangular gravel, poorly graded, non-plastic, dense, dry	Reference	25 324	
S-7	30-32'	22-25-30-28	2.0 2.0	Tan fine SAND, some medium sand, little coarse sand, trace fine gravel, poorly graded, non-plastic, dense, stratified with med-coarse sand fine gravel thin layers	Reference	25 324	

FIELD BORING LOG				Boring No. FTB-91	
Project No. 683-03		Project Name USA THAMMA - BAPP		Page 3 of 3	
Contractor MATHES		Driller K. Bunselmeyer		Date started 10/22/91 completed 10/22/91	
Method HSA		Casing Size 4 1/4 ID		HNU 11.7/10.2 Protection Level D	
Ground El.		Soil Drilled 90'		Total Depth 92'	
Logged by WCHILDS		Checked by DRP		Date 10/22/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-8	40-42	17-22 26-30	2.0' 2.0'	Tan fine SAND, trace medium to coarse sand and fine gravel, poorly graded, non-plastic, dense, dry, stratified	REFERENCE	OK	OK
S-9	50-52	15-24 28-33	2.0' 2.0'	Same as S-8	REFERENCE	OK	OK
S-10	60-62	10-17- 23-40	2.0' 2.0'	Same as S-8	REFERENCE	OK	OK
S-11	70-72	17-23 30-40	2.0' 2.0'	Tan fine SAND, trace medium sand, poorly graded, non-plastic, very dense dry, stratified	REFERENCE	OK	OK
S-12	80-82	20-25 33-46	2.0' 2.0'	Same as S-11	REFERENCE	OK	OK
S-13	90-92	8-22- 25-50	2.0' 2.0'	Tan fine SAND, trace medium sand, poorly graded, non-plastic, dense, stratified, wet	ANALYTICAL	OK	OK
				Terminated boring at 92.0' depth bgs			

FIELD BORING LOG				Boring No. FB9102	
Project No. 685303		Project Name U2ATHAMA BAAP		Page 1 of 3	
Contractor MATHES		Driver T. CRANK		Date started 10-22-91 completed 10/22/91	
Method HSA 4 1/4		Casing Size —		HNU 11.7 (10.2) #1 Protection Level D	
Ground El.		Soil Drilled 87		2' below ground 88.5 Total Depth 89	
Logged by E. SANDIN		Checked by DRP		Date 10/23/91	

	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
							HNU	LEL
400	S-1	0.5-2.5	1-4-8 10	2.0 1.5	0.5 - 0.8 Black silt beneath asphalt 0.8 - 2.5 brown to dark brown silty clay very dense, hard, no horizontal partings.	Analytical Sample F9102002	OK	OK
1415	S-2	4.5-6.5	4/5/ 6/6	2.0 2.0	gray to brown silty clay, dense, plastic, mottled brown,	Analytical Sample F9102006	OK	OK
1420	S-3	9.5-11.5	4/9/ 21/29	2.0 1.7	9.5 - 9.7 brown silty clay with large rounded gravel, dense plastic 9.7 - brown sand fine to coarse with 20% rounded gravel moist, loose	ANALYTICAL SAMPLE F9102011	OK	OK
	S-4	14.5 - 16.5	13/36 50/5"	1.4 1.4	brown sandy gravel fine to coarse with 40% rounded gravel	Reference Sample Headspace Bkg	OK	OK

FIELD BORING LOG				Boring No. FB9100	
Project No. 685303		Project Name USATHAMA BAAP		Page 2 of 3	
Contractor MATHES		Driller T. CRANK		Date started 10/22/91 completed 10/22/91	
Method HSA 4'4"		Casing Size —		HNU 117103 #1	
Ground El.		Soil Drilled 8.7'		Protection Level D	
		± below ground		Total Depth 89'	
Logged by E. SANDIN		Checked by DRP		Date 10/23/91	

	Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
							HNU	LEL
1440	S-5	19.5-24.5	15/26/ 34/50	2.0 2.0	Sand, tan, medium to coarse with some fine and 20% rounded gravel loose, dry, well graded SW	Analytical Sample F9102021	OK	OK
	S-6	24.5-26.5	10/20 20/36	2.0 2.0	Sand, tan, fine to coarse with 10% gravel loose, dry, SW	Reference Sample Headspace Bkg	OK	OK
	S-7	29.5-31.5	11/22/ 36/42	2.0 2.0	sand, tan, fine laminated, well sorted to fine to coarse with gravel, loose, dry SP/SW	Reference Sample Headspace Bkg	OK	OK
1520	S-8	39.5-41.5	12/29/ 39/35	2.0 2.0	Sand, tan, well sorted fine to poorly sorted fine to coarse with fine gravel loose, dry	Reference Sample Headspace Bkg	OK	OK
	S-9	49.5-51.5	19/34 49/36	2.0 2.0	Sand, tan, well sorted to poorly sorted fine to coarse with gravel. occasional orange mottling and brown horizontal laminations dry to moist, loose	Reference Sample Headspace Bkg		

FIELD BORING LOG				Boring No. FTB9102	
Project No. 685303				Project Name USATHAMA	
Contractor MATHES				Driller T. CRANK	
Method HSA 4 1/4"				Date started 10/22/91 completed 10/22/91	
Casing Size		HNU 11.7/103 #1		Protection Level D	
Ground El.		Soil Drilled 87'		Total Depth 89'	
Logged by E. SANDIN		Checked by DRP		Date 10/23/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-10	59.5-61.5	15/26 35/40	2.0 2.0	Sand, tan, fine well sorted to fine to medium well sorted, loose, dry, trace gravel SP	Reference Sample	OK	OK
S-11	69.5-71.5	16/32 28/40	2.0 2.0	sand, tan, fine well sorted with trace gravel and horizontal laminations. one zone of well sorted medium sand with trace gravel loose slightly moist SP	Reference Sample	OK	OK
S-12	79.5-81.5	13/18 27/27	2.0 2.0	Sand, tan, fine, to coarse, to gravel, loose, slightly moist well sorted. SP	Reference Sample	OK	OK
S-13	54.5-56.5 87-89	14/26/ 50/5"	1.4 2.0	Sand, tan, fine, well sorted, no gravel wet, loose water level in augers 86.5' bgs BORS AUGERS 87.0 Last spoon 89.0	F9102089 Analytical Sample	OK	OK

FIELD BORING LOG				BORING NO. FT B-89-01	
PROJECT NO.: 6049- 64		PROJECT NAME: USATHAMA- BAAP			PAGE 1 OF 3
DRILLING CONTRACTOR: MATHES		DRILLER: Ed. Clark		DATE STARTED 10/24/89 COMPLETED 10/24/89	
METHOD: CME-75	CASING SIZE: 4 1/4" ID	TIP Ø: #11 10.6		PROTECTION LEVEL: D	
GROUND ELEV.:	SOIL DRILLED: 92.5'	WATER LEVEL: 86.95'		TOTAL DEPTH: 42.5'	
LOGGED BY: Buss		CHECKED BY: P. Bolmer		DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LE
S#1	0-2	3 346	12/24	Stratified sands and silt. Black fuel oil odor black to gray, product FILL Note: Breathing zone = 5' spn = bkgd.	2.5' gravel fill placed over	700	
S#2	5-7	1 444	15/24	Brown to gray med-fn SAND and gray brown silt. Fuel oil odor, moist-wet. No visible product. FILL SM	TIP just above bkgd	27	11
S#3	10-12	6 1232	18/16	brown to gray coarse-fine sand w/ silt + gravel moist-wet, No odor FILL. SP			
S#4	15-17	6 214350	13/24	tan med-fine sand 15-16.5' over gravel + med-fine SAND FILL SP		Bkgd.	
S#5	20-22	8 192632	19/24	Tan med fine SAND w/ layer of med to coarse SAND + fine gravel at 21.5' SM dry-moist		Bkgd.	

FIELD BORING LOG				BORING NO. FTB-89-01	
PROJECT NO.: 6049- 04		PROJECT NAME: USATHAMA- BAAP			PAGE 2 OF 3
DRILLING CONTRACTOR: MATHES		DRILLER: Ed Clark		DATE STARTED 10/24/89	COMPLETED 10/24/89
METHOD: Augers	CASING SIZE: 4 1/4" ID	TIP GV: #11		PROTECTION LEVEL: D	
GROUND ELEV.:	SOIL DRILLED: 92.5 ft	WATER LEVEL: 86.9 ft		TOTAL DEPTH: 92 ft	
LOGGED BY: Buss		CHECKED BY: P. Bolner		DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
	JAB			50 to 31.5 JAB			
S#6	25-27 30-32	11 30 46 40	20/ 24	25 to 26.5 Tan med-fine SAND 23.5-30.7 Red brown coarse-med SAND w/ fine-med gravel & subangular to rounded some bedding in med. fn Sand stratified. SP/SM		Bkgd	
S#7	40-42 32-34	10 20 22 23	21/ 24	Tan med-fine SAND w/ med coarse sand + gravel layers at 30-32 ft. dry-moist stratified. SP		Bkgd	
				41.7 + 41 ft JAB			
S#8	50-52	15 28 30 40	20/ 24	Tan med-fn SAND w/ med coarse SAND layers. SP		Bkgd	
S#9	60- 62 60-66	12 25 31 36	21/ 24	Tan med-fine SAND stratified w/ thin coarse sand + gravel layers. SP		Bkgd	

FIELD BORING LOG				BORING NO. FTB-89-01	
PROJECT NO.: 6049-04		PROJECT NAME: USATHAMA- BAAP		PAGE 3 OF 3	
DRILLING CONTRACTOR: MATHES		DRILLER: Ed Clark		DATE STARTED 10/24/89 COMPLETED 10/25/89	
METHOD: Auger 3	CASING SIZE: 4 1/4" ID	TIP cv: 10.6		PROTECTION LEVEL: D	
GROUND ELEV.:	SOIL DRILLED: 92'	WATER LEVEL: 86.9' BGS		TOTAL DEPTH: 92	
LOGGED BY: J. Buss		CHECKED BY: P. Bolmer		DATE: 11/20/89	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S#10	70-72	12 28 40 50	20 24	Tan med fn SAND w/ some bedding, med-crse sand and and gravel layer at 71.7 ft. (SP) moist		Bkgd	
S#11	80-82	10 26 30 36	18 24	Tan med-fine SAND w/ some bedding med-crse sand and fine gravel at 81.2 to 81.3 ft. moist (SP)		Bkgd	
S#12	90-92	14 34 38	12 24	Tan med fn SAND No visible bedding or crse layers. wet (SP) WL = 86.9 ft BGS Sand heave to 89 ft BGS BOE = 92 ft.		Bkgd	

BORING



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 85 FOREST AVENUE LOCUST VALLEY, N.Y. 11560
 8000 EXCELSIOR DRIVE MADISON, WI. 53717
 315 W. HURON STREET, SUITE 220, ANN ARBOR, MI 48104

REPORT

SHEET 1 OF 3

DATE STARTED : 6-6-91

DATE FINISHED : 6-6-91

BORING No. PHM-9101

CLIENT : OLIN CORPORATION

PROJECT No : 814-2

PROJECT NAME & LOCATION : OLIN CORP. / BAAP, PARABOO

PREPARED BY: DJO

DRILLING CONTRACTOR : WTD

LOGGED BY: DJO

DRILLER : JON WEEKS

EQUIPMENT :	CASING :	SOIL SAMPLER :		CORE BARREL	AUGER	MON. WELL (MW)		DRILL RIG AND METHOD
		SPLIT SPOON				PIPE	CAP	
TYPE :	—	STAINLESS		—	HSA	3CH. 80 PYC	STEEL	D-120
SIZE :	—	2 x 24"		—	4 1/4" ID	4"	6" x 7"	w/HSA
HAMMER WT / FALL	—	140# / 30"		BIT CARBIDE 8" / 10"				

SURFACE ELEVATION :

SURFACE CONDITIONS : ASPHALT

WATER LEVEL AT

81.5

WHILE

FT. AFTER DRILLING

HRS.

87.77

FT. AFTER

24

HRS.

DEPTH BELOW GRADE	OVA READINGS (PPM)	SAMPLE				BLOWS / 6" OR CORE TIME	STRATA DEPTH / ELEV.	DESCRIPTION AND REMARKS TRACE=0-10% LITTLE=10-20% SOME=20-30% AND=35-50%
		TYPE AND No.	DEPTH (FROM - TO)	MOISTURE CONTENT	RECOVERY			
0	0.8	1	0.25 to 2.25'	M	50%	9/19	0.5' 1.0'	ASPHALT TAN SAND & GRAVEL (FILL) BLK-BRN. F-C SAND w/ LITTLE GRAVEL (SP)
5							3.5'	
	<0.2	2	5 to 7'	M	75%	2/2 3/3		RED-BRN. FINE SAND w/ TRACE GRAVEL (SP)
10								
	<0.2	3	10 to 12'	M	80%	5/2 2/2	12.5' 13.5'	BRN. FINE SAND w/ TRACE GRAVEL (SW) DK. GRAY FINE SAND (SW) (STRONG ODOR - SATURATED)
15							14.5'	CONCRETE
								GRN-GRAY, M-C SAND & GRAVEL (FILL) (NO SAMPLE)
20								
	10.0	4	20 to 22'	M	75%	17/20 22/27		TAN F-M SAND w/ TRACE GRAVEL (SW)
25								

PROJECT NAME: CLIN / BAAP

BORING No. PHM-9101

PROJECT No. 814-2

SHEET 2 OF 3

DEPTH BELOW GRADE	OVA READINGS (PPM)	TYPE AND No.	DEPTH FROM - TO	MOISTURE	BLOW / 6" OR CORE TIME	SAMPLE RECOVERY	STRATA DEPTH / ELEV.	CLASSIFICATION AND REMARKS TRACE -0-10% LITTLE-10-20% SOME-20-30% AND-35-50%
30								TAN, F-M SAND w/ TRAC GRAVEL (SW)
35								GRN- GRAY, F-M SAND (SLIGHT ODOR - OLD FUEL OIL?)
40								
45	310.0	5	40 to 42'	M	21/57 25/32	40%		GRAY, FINE SAND w/ TRACE GRAVEL (SW) (MODERATE ODOR)
50								SAME
55								LT. GRAY, FINE SAND w/ TRACE GRAVEL (SW) (SLIGHT ODOR)
60								SAME
65	435.0	6	60 to 62'	M	28/64 100 57	75%		LT. GRAY, FINE SAND w/ TRACE GRAVEL (SW) (MODERATE ODOR)
70								SAME
75								SAME

CLASSIFICATION AND REMARKS
TRACE -0-10% LITTLE-10-20%
SOME-20-30% AND-35-50%

BORING



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 65 FOREST AVENUE LOCUST VALLEY, N.Y. 11560
 8000 EXCELSIOR DRIVE MADISON, WI. 53717
 315 W. MURON STREET, SUITE 220, ANN ARBOR, MI 48104

REPORT

SHEET 1 OF 2

DATE STARTED : 6-4-91

DATE FINISHED : 6-4-91

BORING No. B-1

CLIENT : OLIN CORPORATION

PROJECT No : 814-2

PROJECT NAME & LOCATION : OLIN CORP./RAAP, BARABOO

PREPARED BY: DJO

DRILLING CONTRACTOR : WTD

LOGGED BY: DJO

DRILLER : JON WEEKS

EQUIPMENT :	CASING :	SOIL SAMPLER :		CORE BARREL	AUGER	MON. WELL (MW)		DRILL RIG AND METHOD
		SPLIT SPOON				PIPE	CAP	
TYPE :	—	STAINLESS		—	HSA	—	—	D-120 W/HSA
SIZE :	—	2 x 24"		—	4 1/4 ID	—	—	
HAMMER WT / FALL	—	140 # / 30"		BIT	CARBIDE 8"			

SURFACE ELEVATION :

SURFACE CONDITIONS : ASPHALT

WATER LEVEL AT 86.5 FT. WHILE DRILLING HRS. FT. AFTER HRS.

DEPTH BELOW GRADE	OVA READINGS (PPM)	SAMPLE				BLOWS / 6" OR CORE TIME	STRATA DEPTH / ELEV.	DESCRIPTION AND REMARKS TRACE=0-10% LITTLE=10-20% SOME=20-30% AND=35-50%
		TYPE AND No.	DEPTH (FROM - TO)	MOISTURE CONTENT	RECOVERY			
0	2.8	1	0.25 to	M	50%	8/12	0.25' / 1'	ASPHALT
			2.25'			13/14		TAN SAND & GRAVEL (FILL)
								GRAY-BLK MOTTLED SILT W/ TRACE SEGR (ML)
5	0.9	2	5 to	M	50%	5/8	3.5'	
			7'			9/14		GRAY-BRN MOTTLED SILT (FILL)
10	0.7	3	10 to	M	80%	16/44	8'	
			12'			40/38		TAN F-C SAND W/ TRACE LITTLE GRAVEL (SP)
15	1.0	4	15 to	M	30%	55/68		TAN M-C SAND W/ TRACE LITTLE GRAVEL (SP)
			17'			100/22		
20	350.0	5	20 to	M	60%	10/29		TAN F-C SAND W/ TRACE LITTLE GRAVEL (SP)
			22'			30/35		(MODERATE ODOR)
25								

PROJECT NAME: OLIN / BAAP

BORING No. E-1

PROJECT No. 814-2

SHEET 2 OF 3

DEPTH BELOW GRADE	OVA READINGS (ppm)	TYPE AND No.	DEPTH FROM - TO	MOISTURE	BLOW / 6" OR CORE TIME	SAMPLE RECOVERY	STRATA DEPTH / ELEV.	CLASSIFICATION AND REMARKS TRACE = 0-10% LITTLE = 10-20% SOME = 20-30% AND = 35-50%
30	620.0	6	25 to 27'	M	20/16 23/25	60%	37.5'	TAN F-M SAND w/ TRACE GRAVEL. BLK SILT IN TIP OF SPOON (SW) (STRONG ODOR)
35	105.0	7	30 to 32'	M	21/37 52/77	75%		TAN F-M SAND w/ TRACE GRAVEL (SW) (SLIGHT ODOR)
40	9.6	8	35 to 37'	M	9/20 31/63	60%		TAN FINE SAND (SW) GRAY F-M SAND (SW) (SLIGHT ODOR)
45	240.0	9	40 to 42'	M	16/55 58/81	60%		GRAY F-M SAND (SW) (MODERATE ODOR)
50	375.0	10	45 to 47'	M	11/26 49/122	50%		GRAY F-M SAND w/ TRACE GRAVEL (SW) (STRONG ODOR)
55	270.0	11	50 to 52'	M	11/30 41/68	60%	53.5'	SAME
60	15.0	12	55 to 57'	M	7/13 37/59	60%		TAN F-M SAND (SW) (NO ODOR)
65	11.0	13	60 to 62'	M	8/18 29/43	75%		SAME
70	58.0	14	65 to 67'	M	15/36 65/90	75%	66.0'	TAN F-M SAND w/ TRACE GRAVEL (SW) (NO ODOR) GRAY F-M SAND w/ TRACE GRAVEL (SW) (SLIGHT ODOR - OLD FUEL OIL?)
75	160.0	15	70 to 72'	M	16/40 60/79	75%		SAME

SHEET 3 of 3

[illegible]

All abandonment work shall be performed in accordance with the provisions of Chapters NR 111, NR 112 or NR 141, Wis. Admin. Code, whichever is applicable. Also, see instructions on back.

GENERAL INFORMATION		(10) FACILITY NAME
Well/Drillhole/Borehole Location	County	Original Well Owner (If Known)
	SAUK	N/A
1/4 of 1/4 of Sec. : T. 10 N. 2 E. 6		Present Owner
(If applicable)		OLIN CORP. / BADGER AAP
Gov't Lot	Grid Number	Street or Route
		HIGHWAY 12 SOUTH
Grid Location		City, State, Zip Code
ft. <input type="checkbox"/> N <input type="checkbox"/> S. ft. <input type="checkbox"/> E. <input type="checkbox"/> W.		BARABOON, WI 53912
Civil Town Name		Factory Well No. and/or Name (If Applicable)
SUMPTON		B-1
Street Address of Well		WI Unique Well No.
OLIN CORPORATION / BAAP		
City, Village		Reason for Abandonment
		TEST BORING
		Date of Abandonment
		6-5-91

WELL/DRILLHOLE/BOREHOLE INFORMATION	
(3) Original Well/Drillhole/Borehole Construction Completed On (Date)	(4) Depth to Water Feet
6-4-91	86.5
<input type="checkbox"/> Monitoring Well <input type="checkbox"/> Water Well <input type="checkbox"/> Drillhole <input checked="" type="checkbox"/> Borehole	Pump & Piping Removed? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Not Applicable Liner(s) Removed? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Not Applicable Screen Removed? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Not Applicable Casing Left in Place? <input type="checkbox"/> Yes <input type="checkbox"/> No If No, Explain:
Construction Type: <input checked="" type="checkbox"/> Drilled <input type="checkbox"/> Driven (Sandpoint) <input type="checkbox"/> Dug <input type="checkbox"/> Other (Specify)	Was Casing Cut Off Below Surface? <input type="checkbox"/> Yes <input type="checkbox"/> No Did Sealing Material Rise to Surface? <input type="checkbox"/> Yes <input type="checkbox"/> No Did Material Settle After 24 Hours? <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, Was Hole Retopped? <input type="checkbox"/> Yes <input type="checkbox"/> No
Formation Type: <input checked="" type="checkbox"/> Unconsolidated Formation <input type="checkbox"/> Bedrock	Required Method of Placing Sealing Material: <input checked="" type="checkbox"/> Conductor Pipe-Gravity <input type="checkbox"/> Conductor Pipe-Pumped <input type="checkbox"/> Dump Bailer <input type="checkbox"/> Other (Explain)
Total Well-Depth (ft.) 90 Casing Diameter (ins.) (From ground surface)	(6) Sealing Materials For monitoring wells and monitoring well boreholes only: <input type="checkbox"/> Neat Cement Grout <input type="checkbox"/> Bentonite Pellets <input type="checkbox"/> Sand-Cement (Concrete) Grout <input type="checkbox"/> Granular Bentonite <input type="checkbox"/> Concrete <input type="checkbox"/> Bentonite-Sand Slurry <input type="checkbox"/> Clay-Sand Slurry <input checked="" type="checkbox"/> Chipped Bentonite <input type="checkbox"/> Bentonite-Cement Grout
Casing Depth (ft.) Was Well Annular Space Grouted? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown If Yes, To What Depth? N/A Feet	

Sealing Material Used	From (Ft.)	To (Ft.)	No. Yards, Sacks Sealant or Volume	Mix Ratio or Mud Weight
CONCRETE	Surface	1	—	
CHIPPED BENTONITE	1	90	43 BAGS	

(7) Comments:

(9) Name of Person or Firm Doing Sealing Work

WTD ENVIRONMENTAL DRILLING

Signature of Person Doing Work: David J. Oley

Date Signed: 6-12-91

Street or Route: 8000 EXCELSIOR DR.

Telephone Number: (608) 836-1500

City, State, Zip Code:

(10) FOR DNR OR COUNTY USE ONLY

Date Received/Inspected: District/County:

Reviewer/Inspector:

Follow-up Necessary:

BORING



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 85 FOREST AVENUE LOCUST VALLEY, N.Y. 11560
 8000 EXCELSIOR DRIVE MADISON, MI 48064
 315 E. HURON STREET, SUITE 220, ANN ARBOR, MI 48104

REPORT

SHEET 1 OF 3

DATE STARTED : 6-5-91

DATE FINISHED : 6-5-91

BORING No. B-2

CLIENT : OLIN CORPORATION

PROJECT No : 814-2

PROJECT NAME & LOCATION : OLIN CORP/BAAP, PARABOO

PREPARED BY: DJO

DRILLING CONTRACTOR : WTD

LOGGED BY: DJO

DRILLER : JON WEEKS

EQUIPMENT :	CASING :	SOIL SAMPLER :		CORE BARREL	AUGER	MON. WELL (MW)		DRILL RIG AND METHOD
		SPLIT SPOON				PIPE	CAP	
TYPE :	—	STAINLESS		—	HSA	—	—	D-120
SIZE :	—	2 X 24"		—	4 1/4" ID	—	—	w/ HSA
HAMMER WT / FALL	—	140#/30"		BIT CARBIDE 8"				

SURFACE ELEVATION :

SURFACE CONDITIONS : ASPHALT

WATER LEVEL AT 88.5 FT. AFTER DRILLING WHILE DRILLING HRS. FT. AFTER HRS.

DEPTH BELOW GRADE	CVA READINGS (ppm)	SAMPLE				BLOWS / 6" OR CORE TIME	STRATA DEPTH / ELEV.	DESCRIPTION AND REMARKS TRACE=0-10% LITTLE=10-20% SOME=20-30% AND=35-50%
		TYPE AND No.	DEPTH (FROM TO)	MOISTURE CONTENT	RECOVERY			
0	13.0	1	0.25 to 2.25'	M	50%	12/21 37/58	0.25' 1.0'	ASPHALT TAN SAND & GRAVEL (FILL)
5								
	10.0	2	5 to 7'	M	60%	4/6 12/16	7.5'	RED-BRN MOTTLED SILT (s)
10								
	<0.2	3	10 to 12'	M	60%	3/10 18/26		BRN. F-C SAND (SP) (2' LENS OF BLK SANDS AT 11')
15								
	0.2	4	15 to 17'	M	60%	5/16 69/76		BRN. M-C SAND w/ TRAC - LITTLE GRAVEL (SP)
20								
	1.4	5	20 to 22'	M	60%	8/35 36/30	21.0'	SAME TAN F-M SAND (SW)
25								

PROJECT NAME: CLIN / BAAP

BORING No. B-6

PROJECT No. 814-2

SHEET 2 of 3

DEPTH BELOW GRADE	OVA READINGS (PPM)	TYPE AND No.	DEPTH FROM - TO	MOISTURE	BLOW / 6" OR CORE TIME	SAMPLE RECOVERY	STRATA DEPTH / ELEV.	CLASSIFICATION AND REMARKS TRACE -0-10% LITTLE-10-20% SOME-20-30% AND-35-50%
30	0.4	6	25 to 27'	M	13/25 67/100	75%		TAN F-M SAND w/ TRACE GRAVEL (SW)
35	<0.2	7	30 to 32'	M	6/14 28/38	75%		SAME
40	0.5	8	35 to 37'	M	12/27 44/60	75%		TAN F-M SAND w/ TRACE LITTLE GRAVEL (SP)
45	<0.2	9	40 to 42'	M	9/12 20/38	80%		TAN F-M SAND (SW)
50	0.4	10	45 to 47'	M	18/56 90/100	90%		TAN F-M SAND w/ TRACE GRAVEL (SW)
55	<0.2	11	50 to 52'	M	9/17 24/49	75%		SAME
60	1.1	12	55 to 57'	M	14/35 59/91	75%		TAN F-M SAND w/ LENSES F-M GRAVEL (SW)
65	0.9	13	60 to 62'	M	11/28 43/48	80%		TAN F-M SAND w/ TRACE C. SAND (SW)
70	0.5	14	65 to 67'	M	13/37 59/60	80%		TAN F-M SAND (SW)
75	0.3	15	70 to 72'	M	12/16 53/64	80%		SAME

PROJECT NAME: CLIN / BAAP

BORING No. B-2

PROJECT No. 814-2

SHEET 3 OF 3

DEPTH BELOW GRADE	OVA READINGS	TYPE AND No.	DEPTH FROM - TO	MOISTURE	BLOW / 6" OR CORE TIME	SAMPLE RECOVERY	STRATA DEPTH / ELEV.	CLASSIFICATION AND REMARKS TRACE -0-10% LITTLE-10-20% SOME-20-30% AND-35-50%	
80	40.2	16	75 to 77'	M	11/17 24/28	60%	81.0'	TAN F-C SAND (SP)	
85	4.9	17	80 to 82'	M	10/26 77/100	75%			SAME GRAY FINE SAND (SL) (SLIGHT ODOR)
90	610.0	18	85 to 87'	M	12/26 79/122	75%			SAME (STRONG ODOR)
	8.8	19	90 to 92'	W	44/122	50%			TAN F-M SAND (SW) (NO ODOR)

All abandonment work shall be performed in accordance with the provisions of Chapters NR 111, NR 112 or NR 141, Wis. Admin. Code, whichever is applicable. Also, see instructions on back.

(1) GENERAL INFORMATION		(2) FACILITY NAME	
Well/Drillhole/Borehole Location	County SAUK	Original Well Owner (If Known) N/A	
1/4 of 1/4 of Sec. : T. 10 N. R. 6	<input checked="" type="checkbox"/> E <input type="checkbox"/> W	Present Well Owner OLIN CORP. / BADGER AAP	
(If applicable)		Street or Route HIGHWAY 12 SOUTH	
Gov't Lot	Grid Number	City, State, Zip Code BARABOO, WI 53913	
Grid Location	ft. <input type="checkbox"/> N. <input type="checkbox"/> S. ft. <input type="checkbox"/> E. <input type="checkbox"/> W.	Factory Well No. and/or Name (If Applicable)	
Civil Town Name SUMPTER		WI Unique Well No. B-2	
Street Address or Well		Reason For Abandonment TEST BORING	
City, Village OLIN CORPORATION / BAAP		Date of Abandonment 6-5-91	

WELL/DRILLHOLE/BOREHOLE INFORMATION

(3) Original Well/Drillhole/Borehole Construction Completed On
(Date) 6-4-91

- ☐ Monitoring Well
☐ Water Well
☐ Drillhole
☒ Borehole

BORING LOG
Construction Report Available?
☒ Yes ☐ No

Construction Type:

- ☒ Drilled ☐ Driven (Sandpoint) ☐ Dog
☐ Other (Specify)

Formation Type:

- ☒ Unconsolidated Formation ☐ Bedrock

Total Well Depth (ft.) 90 Casing Diameter (ins.)

Casing Depth (ft.)

Was Well Annular Space Grouted? ☐ Yes ☐ No ☐ Unknown
If Yes, To What Depth? N/A Feet

(4) Depth to Water (Feet) 88.5

Pump & Piping Removed? ☐ Yes ☐ No ☒ Not Applicable
Liner(s) Removed? ☐ Yes ☐ No ☒ Not Applicable
Screen Removed? ☐ Yes ☐ No ☒ Not Applicable
Casing Left in Place? ☐ Yes ☐ No
If No, Explain

Was Casing Cut Off Below Surface? ☐ Yes ☐ No
Did Sealing Material Rise to Surface? ☐ Yes ☐ No N/A
Did Material Settle After 24 Hours? ☐ Yes ☐ No
If Yes, Was Hole Retopped? ☐ Yes ☐ No

(5) Required Method of Placing Sealing Material

- ☒ Conductor Pipe-Gravity ☐ Conductor Pipe-Pumped
☐ Dump Bailer ☐ Other (Explain)

(6) Sealing Materials

- ☐ Neat Cement Grout
☐ Sand-Cement (Concrete) Grout
☐ Concrete
☐ Clay-Sand Slurry
☐ Bentonite-Sand Slurry
☒ Chipped Bentonite
- For monitoring wells and monitoring well boreholes only:
☐ Bentonite Pellets
☐ Granular Bentonite
☐ Bentonite - Cement Grout

Sealing Material Used	From (Ft.)	To (Ft.)	No. Yards, Sacks Sealant or Volume	Mix Ratio or Mud Weight
CONCRETE	Surface	1	—	
CHIPPED BENTONITE	1	90	40.5 BAGS	

(7) Comments:

(8) Name of Person or Firm Doing Sealing Work

WTD ENVIRONMENTAL DRILLING
Signature of Person Doing Work: David G. Ols
Date Signed: 6-12-91
Street or Route: 7000 EXCELSIOR DR.
Telephone Number: (608) 836-1500
City, State, Zip Code:

(10) FOR DNR OR COUNTY USE ONLY

Date Received/Inspected: District/County:
Reviewer/Inspector:
Follow-up Necessary:

BORING



eder associates, consulting engineers p. c.

 85 FOREST AVENUE LOCUST VALLEY, N.Y. 11560
 8000 EXCELSIOR DRIVE MADISON, WI. 53717
 315 W. HURON STREET, SUITE 220, ANN ARBOR, MI 48104

REPORT

SHEET 1 OF 1

DATE STARTED : 6-6-91

DATE FINISHED : 6-6-91

BORING No. B-3

CLIENT : OLIN CORPORATION

PROJECT No : 814-a

PROJECT NAME & LOCATION : OLIN CORP. / BAAP, BARABOO

PREPARED BY: DJO

DRILLING CONTRACTOR : WTD

LOGGED BY: DJO

DRILLER : JON WEEKS

EQUIPMENT :	CASING :	SOIL SAMPLER :		CORE BARREL	AUGER	MON. WELL (MW)		DRILL RIG AND METHOD
		SPLIT SPOON				PIPE	CAP	
TYPE :	—	STAINLESS		—	HSA	—	—	D-120
SIZE :	—	2 X 24'		—	4 1/4" ID	—	—	w/ HSA
HAMMER WT / FALL	—	140# / 30'		BT	CARBIDE 8"			

SURFACE ELEVATION :

SURFACE CONDITIONS : ASPHALT

WATER LEVEL AT

FT. AFTER

HRS.

FT. AFTER

HRS.

DEPTH BELOW GRADE	OVA READINGS	SAMPLE				BLOWS / 6" OR CORE TIME	STRATA DEPTH / ELEV.	DESCRIPTION AND REMARKS TRACE=0-10% LITTLE=10-20% SOME=20-30% AND=35-50%
		TYPE AND No.	DEPTH (FROM - TO)	MOISTURE CONTENT	RECOVERY			
0		1	0.25 to	M	40%	9/18	0.25' 1.0'	ASPHALT TAN SAND & GRAVEL (FILL) LT. BRN. FINE SAND w/ TRACE GRAVEL (SP) (2" LENS BLK CINDERS)
			2.25'					
5		2	5 to	M	75%	6/7	4.5'	RED-BRN. FINE SAND w/ TRACE C. SAND & GRAV L (SP)
			7'					
10		3	10 to	M	60%	7/11	12.5' 13.5'	0.5' BLK CINDERS TAN FINE SAND w/ TRACE GRAVEL (SW) GRAY FINE SAND (SW) (STRONG ODOR-SATURATED)
			12'					
15							EOB	CONCRETE
20								
25								

All abandonment work shall be performed in accordance with the provisions of Chapters NR 111, NR 112 or NR 141, Wis. Admin. Code, whichever is applicable. Also, see instructions on back.

(1) GENERAL INFORMATION		(2) FACILITY NAME	
Well/Drillhole/Borehole Location	County SAUK	Original Well Owner (if known) N/A	
1/4 of 1/4 of Sec. T. 10 N. R. 6	Present Well Owner OLIN CORP. / BADGER AAP	Street or Route HIGHWAY 12 SOUTH	
Grid Location ft. <input type="checkbox"/> N. <input type="checkbox"/> S. ft. <input type="checkbox"/> E. <input type="checkbox"/> W.	Grid Number	City, State, Zip Code BARABOO, WI 53913	
Civil Town Name SUMPTER	Facility Well No. and/or Name (if Applicable) B-3	WI Unique Well No.	
Street Address of Well OLIN CORPORATION / BAAP	Reason for Abandonment ENCOUNTERED CONCRETE (FOOTINGS?)	Date of Abandonment 6-5-91	
City, Village			

WELL/DRILLHOLE/BOREHOLE INFORMATION

(3) Original Well/Drillhole/Borehole Construction Completed On
(Date) **6-4-91**

☐ Monitoring Well
☐ Water Well
☐ Drillhole
☒ Borehole

Construction Type:
☒ Drilled ☐ Driven (Sandpoint) ☐ Dug
☐ Other (Specify)

Formation Type:
☒ Unconsolidated Formation ☐ Bedrock

Total Well Depth (ft.) **13.5** Casing Diameter (ins.) **---**
(From ground surface)

Casing Depth (ft.) **---**

Was Well Annular Space Grouted? ☐ Yes ☐ No ☐ Unknown
If Yes, To What Depth? **N/A** Feet

(4) Depth to Water (Feet) **---**

Pump & Piping Removed? ☐ Yes ☐ No ☒ Not Applicable
Liner(s) Removed? ☐ Yes ☐ No ☒ Not Applicable
Screen Removed? ☐ Yes ☐ No ☒ Not Applicable
Casing Left in Place? ☐ Yes ☐ No
If No, Explain

Was Casing Cut Off Below Surface? ☐ Yes ☐ No
Did Sealing Material Rise to Surface? ☐ Yes ☐ No **N/A**
Did Material Settle After 24 Hours? ☐ Yes ☐ No
If Yes, Was Hole Retopped? ☐ Yes ☐ No

(5) Required Method of Placing Sealing Material
☒ Conductor Pipe-Gravity ☐ Conductor Pipe-Pumped
☐ Dump Bailer ☐ Other (Explain)

(6) Sealing Materials For monitoring wells and monitoring well boreholes only
☐ Near Cement Grout
☐ Sand-Cement (Concrete) Grout
☐ Concrete ☐ Bentonite Pellets
☐ Clay-Sand Slurry ☐ Granular Bentonite
☐ Bentonite-Sand Slurry ☐ Bentonite - Cement Grout
☒ Chipped Bentonite

Sealing Material Used	From (Ft.)	To (Ft.)	No. Yards, Sacks Sealant or Volume	Mix Ratio or Mud Weight
CONCRETE	Surface	1	---	
CHIPPED BENTONITE	1	13.5	6.5 BAGS	

(7) Comments:

(9) Name of Person or Firm Doing Sealing Work
WTD ENVIRONMENTAL DRILLING

Signature of Person Doing Work **Dward A. Oly** Date Signed **6-12-91**
Street or Route **8000 EXCELSIOR DR.** Telephone Number **(608) 836-1500**
City, State, Zip Code

(10) FOR DNR OR COUNTY USE ONLY

Date Received/Inspected District/County
Reviewer/Inspector
Follow-up Necessary



eder associates, consulting engineers p. c.

85 FOREST AVENUE LOCUST VALLEY, N.Y. 11560
8000 EXCELSIOR DRIVE MADISON, W. 53717
315 W. HURON STREET, SUITE 220, ANN ARBOR, MI 48104

REPORT

SHEET 1 OF 2

DATE STARTED : 6-7-91

DATE FINISHED : 6-7-91

BORING No. B-4

CLIENT: OLIN CORPORATION

PROJECT No : 814-2

PROJECT NAME & LOCATION : OLIN CORP. / BAAP BARABOO

PREPARED BY: DJD

DRILLING CONTRACTOR : WTD

LOGGED BY: DJO

DRILLER : JON WEEKS

EQUIPMENT :	CASING :	SOIL SAMPLER :		CORE BARREL	AUGER	MON. WELL (MW)		DRILL RIG AND METHOD
		SPLIT SPOON				PIPE	CAP	
TYPE :	—	STAINLESS		—	HSA	—	—	D-120 w/ HSA
SIZE :	—	2 x 24"		—	1 1/4" ID	—	—	
HAMMER WT / FALL	—	140# / 30"		BIT CARBIDE 8"				

SURFACE ELEVATION :

SURFACE CONDITIONS : ASPHALT

WATER LEVEL AT

87.0 FT. ^{WHILE} AFTER DRILLING HRS

FT. AFTER

HRS.

DEPTH BELOW GRADE	OVA READINGS (PPM)	SAMPLE				BLOWS / 6" OR CORE TIME	STRATA DEPTH / ELEV.	DESCRIPTION AND REMARKS TRACE=0-10% LITTLE=10-20% SOME=20-30% AND=35-50%
		TYPE AND No.	DEPTH (FROM - TO)	MOISTURE CONTENT	RECOVERY			
0	3.5	1	0.25 to	M	75%	18/19	<u>0.25</u> <u>1.0'</u> <u>ASPHALT</u> <u>TAN SAND & GRAVEL (FILL)</u> <u>GRAY-BRN MOTLED SILT (M</u> <u>(BLK SILT FINAL 3")</u>	
			2.25'			19/20		
5								
10	<0.2	2	5 to	M	90%	6/10	SAME	
			7'			14/18		
15								
15	<0.2	3	10 to	M	60%	7/12	RED-BRN, F-M SAND (Su (TAN, F-M SAND FINAL 2")	
			12'			13/17		
20								
20	1.2	4	15 to	M	50%	14/57	TAN SAND & GRAVEL w/ COBBLES (GP)	
			17'			$\frac{100}{5}$		
25								
25	—	5	20 to	—	NONE	$\frac{100}{2}$	SAME	
			22'					

SHEET 3 OF 3



All abandonment work shall be performed in accordance with the provisions of Chapters NR 111, NR 112 or NR 141, Wis. Admin. Code, whichever is applicable. Also, see instructions on back.

(1) GENERAL INFORMATION		(2) FACILITY NAME
Well/Drillhole/Borehole Location	County SAUK	Original Well Owner (If Known) N/A
<u>1/4 of</u> <u>1/4 of Sec.</u> <u>10</u> <u>NR</u> <u>6</u> (If applicable)	<input checked="" type="checkbox"/> E <input type="checkbox"/> W	Present Well Owner OLIN CORP. / BADGER AAP
Gov't Lot	Grid Number	Street or Route HIGHWAY 12 SOUTH
Grid Location <u>ft.</u> <input type="checkbox"/> N <input type="checkbox"/> S. <u>ft.</u> <input type="checkbox"/> E <input type="checkbox"/> W.		City, State, Zip Code PARABOO, WI 52913
Civil Town Name SUMPTER		Factory Well No. and/or Name (If Applicable) B-4
Street Address of Well OLIN CORPORATION / BAAP		WI Unique Well No. ---
City, Village		Reason for Abandonment TEST BORING
		Date of Abandonment 6-5-91

WELL/DRILLHOLE/BOREHOLE INFORMATION

(3) Original Well/Drillhole/Borehole Construction Completed On (Date) 6-5-91		(4) Depth to Water (Feet) 37
<input type="checkbox"/> Monitoring Well <input type="checkbox"/> Water Well <input type="checkbox"/> Drillhole <input checked="" type="checkbox"/> Borehole	BORING LOG Construction Report Available? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Pump & Piping Removed? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Not Applicable Liner(s) Removed? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Not Applicable Screen Removed? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Not Applicable Casing Left in Place? <input type="checkbox"/> Yes <input type="checkbox"/> No If No, Explain N/A
Construction Type: <input checked="" type="checkbox"/> Drilled <input type="checkbox"/> Driven (Sandpoint) <input type="checkbox"/> Dug <input type="checkbox"/> Other (Specify) _____		Was Casing Cut Off Below Surface? <input type="checkbox"/> Yes <input type="checkbox"/> No Did Sealing Material Rise to Surface? <input type="checkbox"/> Yes <input type="checkbox"/> No Did Material Settle After 24 Hours? <input type="checkbox"/> Yes <input type="checkbox"/> No N/A If Yes, Was Hole Retopped? <input type="checkbox"/> Yes <input type="checkbox"/> No
Formation Type: <input checked="" type="checkbox"/> Unconsolidated Formation <input type="checkbox"/> Bedrock		(5) Required Method of Placing Sealing Material <input checked="" type="checkbox"/> Conductor Pipe-Gravity <input type="checkbox"/> Conductor Pipe-Pumped <input type="checkbox"/> Dump Bailer <input type="checkbox"/> Other (Explain) _____
Total Well Depth (ft.) 90 Casing Diameter (ins.) _____ (From ground surface)		(6) Sealing Materials For monitoring wells and monitoring well boreholes only <input type="checkbox"/> Near Cement Grout <input type="checkbox"/> Bentonite Pellets <input type="checkbox"/> Sand-Cement (Concrete) Grout <input type="checkbox"/> Granular Bentonite <input type="checkbox"/> Concrete <input type="checkbox"/> Bentonite - Cement Grout <input type="checkbox"/> Clay-Sand Slurry <input type="checkbox"/> Bentonite-Sand Slurry <input checked="" type="checkbox"/> Chipped Bentonite
Casing Depth (ft.) _____		
Was Well Annular Space Grouted? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown If Yes, To What Depth? N/A Feet		

(7) Sealing Material Used	From (Ft.)	To (Ft.)	No. Yards, Sacks Sealant or Volume	Mix Ratio or Mud Weight
CONCRETE	Surface	1	—	
SOIL CUTTINGS	1	4	—	
CHIPPED BENTONITE	4	90	34 BAGS	

(8) Comments:

(9) Name of Person or Firm Doing Sealing Work WTO ENVIRONMENTAL DRILLING		(10) FOR DNR OR COUNTY USE ONLY	
Signature of Person Doing Work David J. Ols	Date Signed 6-13-91	Date Received/Inspected	District/County
Street or Route 2000 ECKELSHOR DR	Telephone Number (608) 836-1500	Reviewer/Inspector	
City, State, Zip Code		Follow-up Necessary	

FIELD BORING LOG				Boring No. PBA-11-01C	
Project No. 1853-03		Project Name BAAP RI/ES		Page 1 of 1	
Contractor Lays Inc.		Driller Art R		Date started 10/24 completed 10/24	
Method Dual wall		Casing Size 9" OD		HNU 11.7/102 TIP	
Ground El.		Soil Drilled 160'		Protection Level D	
Logged by Colby		Checked by DRP		Date 10/26/91	
				Total Depth 160'	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		
						HNU	ATK	LEL
S-1	0-10			orgnules, gravel, cobbles + crs sand (SP-GP)	10'	JAR	ATK	0 %
S-2	10-20			Med-crs sand some thin gravel layers		↓	↓	↓
S-3	20-30			(SP)				
S-4	30-40			crs sand + fine gravel	30'			
				(SP-GP)	40'	↓	↓	↓
S-5	40-50			Med-crs sand				
S-6	50-60			some thin gravel layers				
S-7	60-70			(SP)				
S-8	70-80			↓				
S-9	80-90				Σ 85			
S-10	90-100							
S-11	100-110			Gravel, cobbles + crs sand poorly sorted	11'			
S-12	110-120			(SP-GP)				
S-13	120-130			Fine Med sand	115'			
S-14	130-140			some thin gravel layers				
S-15	140-150			(SP)				
	150-160			↓	Bot 160'			

FIELD BORING LOG				Boring No. PBU-11-02 B	
Project No. 6853-03	Project Name BAAP RI/FS			Page 1 of 1	
Contractor Layne	Driller Art R	Date started 9/28	completed 9/28		
Method Dual-Wall Hammer	Casing Size 1" OD	MNU 11.7/10.2 Tip # 5	Protection Level D		
Ground El.	Soil Drilled 120'	± below ground 83	Total Depth 120'		
Logged by Biker Colby		Checked by DRP	Date 10/10/91		

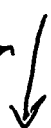

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		
						MNU	LEL	
S-1	0-10'			Brown-Tan Fine-Medium sand poorly sorted		JAR	ATR	0%
S-2	10-20			(SP)		84%	84%	
S-3	20-30							
S-4	30-40							
S-5	40-50							
S-6	50-60							
S-7	60-70			Tan Fine sand w/some med sand + gravel				
S-8	70-80			(SP-SW)				
S-9	80-90			Tan Medium-Coarse Sand	± 83'			
	90-100			at 100' gravel + cobbles to 115				
	100-110			(SP-GP)				
	110-120			below 115 med sand w/ some coarse sand				
				(SP)				
				<u>B.O.E. 120'</u>				

see PBU-01-02

FIELD BORING LOG				Boring No. PBN-91-02	
Project No. 6853-02	Project Name BAAP R/Fs		Page 1 of 1		
Contractor [unclear]	Driller Art R	Date started 9-30	completed 9-30		
Method Dual-Wall Hammer	Casing Size 9" OD	HNU 11.7/10.2 TIP	Protection Level D		
Ground El.	Soil Drilled 170'	± below ground 85'	Total Depth 160'-170'		
Logged by Bubs Galby		Checked by DRP	Date 10/10/91		

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-1 - S-9 see PBN-91-02B	0-10			Brown-Tan Fine-Medium		0	0%
	10-20			SAND Poorly Sorted		0	
	20-30						
	30-40			(SP)			
	40-50			some small thin layers of fine gravel			
	50-60						
	60-70						
	70-80						
	80-90			✓	Σ 85'		
S-10	90-100						
S-11	100-110			coarse sand, gravel + cobbles 98'-108'			
S-12	110-120			Med-Lrs SAND (SP)			
S-13	120-130			Some layers of gravel			
S-14	130-140						
S-15	140-150						
S-16	150-160						
S-17	160-170			↓ <u>B.O.E. 170'</u>			

FIELD BORING LOG				Boring No. PBN-91-03 B	
Project No. 6853-03		Project Name BHAP RI/FS		Page 1 of 1	
Contractor L.W. H. R.		Driller ART R		Date started 9/26 completed 9/26	
Method <u>Hand</u>		Casing Size 9" OD		HNU 11.7/10.2 Tip 5 Protection Level D	
Ground El		Soil Drilled 110'		2' below ground 90' Total Depth 110'	
Logged by Colby/Buss		Checked by DRP		Date 10/10/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-1	0-10'			Brown-Tan fn-filled SAND (SP)		JAR	0%
S-2	10-20			similar to S-1		BJ	
S-3	20-30			brown 			
S-4	30-40						
S-5	40-50						
S-6	50-60			Tan fn SAND wt/ little medium Sand (SP-SW)			
S-7	60-70						
S-8	70-80				I ~ 80'		
S-9	80-90			^{crs} Tan med- fn SAND at 95' crs gravel and cobbles to 105' SP-GP			
S-10	90-100			below 105 med-crs sand wt little gravel + cobbles. <u>B.O.E. 110'</u>			
S-11	100-110						

FIELD BORING LOG				Boring No. PBW-11-03	
Project No. 6853-03	Project Name BAAP RE/ES		Page 1 of 1		
Contractor / name	Driller Art	Date started 9-27	completed 9-27		
Method H Dual-Wall Hammer	Casing Size 4" OD	HNU 11.7/10.2 TIP-5	Protection Level D		
Ground El.	Soil Drilled 150'	± below ground 79'	Total Depth 150'		
Logged by B. W. Calby		Checked by DRP	Date 10/10/91		

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
See 5-1 to 5-11 PBW-91-03B	0-50			Brown-Tan Fine-Med SAND (SP)		JAR AIR	0%
						Big	Big
	50-80			Tan Fine Sand Some Medium Sand (SP-SW)			
	80-100			Tan Med-coarse sand changing to coarse sand & gravel			
	100-110			gravel to 105'			
5-12	110-120			Tan Med-coarse sand Some small gravel			
5-13	120-130			(SP)			
5-14	130-140						
5-15	140-150			BOE 150'			

FIELD BORING LOG				BORING NO. PBM-90-01D	
PROJECT NO.: 6298-11		PROJECT NAME: USATAMA - SAAP FS			PAGE 1 OF 9
DRILLING CONTRACTOR: LAYNE SOUTHWEST		DRILLER: G Rodriguez		DATE STARTED 8/23/90	COMPLETED 8/24/90
METHOD: DUAL WALL	CASING SIZE: 9 IN.	TIP W: TE#2		PROTECTION LEVEL: 0	
GROUND ELEV.:	SOIL DRILLED: 217.0'	WATER LEVEL: 86.0'		TOTAL DEPTH: 217.0'	
LOGGED BY: J. Bliss		CHECKED BY: P. Bolter		DATE: 9/28/90	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S#1	0-10.5	—	ML SM	Black organic topsoil grading to dark brown fine silt Sand + Silt 0-8.5' Tan fine-med sand with occ. gravel 8-10.5'	Change 8.5'		
S#2	10-20		SM	Med fine SAND little silt.			
S#3	20-30		SP SM	med fine sand, stratified w/ coarse-med sand			
S#4	30-40		SM	Tan Med-Fn SAND			
S#5	40-50		SP SM	Tan Crse to Fn SAND trace fine gravel.			
S#6	50-60		SM	Tan med-Fn SAND, similar to S#4			
S#7	60-70		SM	Tan med-fine SAND w/ trace crse sand.			

FIELD BORING LOG			BORING NO. PBM-90-01C		
PROJECT NO.: 6296-11		PROJECT NAME: USATHAMA- BAAP FS			PAGE 2 OF 4
DRILLING CONTRACTOR: LAYNE SOUTHWEST		DRILLER: G. Rodriguez		DATE STARTED 8/23	COMPLETED 8/24/90
METHOD: DUAL WALL	CASING SIZE: 9 IN.	TIP #V: TE#2		PROTECTION LEVEL: D	
GROUND ELEV.:	SOIL DRILLED: 217.0'	WATER LEVEL: 86.0'		TOTAL DEPTH: 217.0'	
LOGGED BY: J Blass		CHECKED BY: P. Bohner		DATE: 9/28/90	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S#8	70-80 ft		SM	Tan Med Sn SAND V. moist possible thin silt or cemented layer of v. Sn sand at ~80 ft.	change at 80		
S#9	80-90 ft		SM ML	Brown fine "silt balls" from 80-83 ft then grading to coarse to fine sand with increasing gravel to 90 ft.	change at 83 change at 90		
S#10	90-100		SM	med-Sn SAND becoming coarser at 97 ft	change at 97 ft.		
S#11	100-110		GP	Sn to coarse gravel	change at 110		
S#12	110-112		SP	crse-Med SAND with occasional gravel			

FIELD BORING LOG

BORING NO. PBM-90-010

PROJECT NO.: 6298-11

PROJECT NAME: USATHANA - SAAP FS

PAGE 3 OF 4

DRILLING CONTRACTOR: LAYNE SOUTHWEST

DRILLER: G RodriguezDATE STARTED 8/23COMPLETED 8/24/90

METHOD: DUAL WALL

CASING SIZE: 9 IN.

TIP W: TE #2PROTECTION LEVEL: DGROUND ELEV.: 217.0SOIL DRILLED: 217.0WATER LEVEL: 86.0TOTAL DEPTH: 217.0'LOGGED BY: J BuasCHECKED BY: P. PalmerDATE: 9/28/90

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S#13							
S#13	120-130		SP	Med-Fn SAND trace gravel			
S#14	130-140		SP	Med-Fn SAND with some coarse SAND thin gravel layer at 135 ft.			
S#15	140-150		SP	Med-Fn SAND w/ trace coarse sand + gravel.			
S#16	150-160		SP	Med-Fn SAND			
S#17	160-170		SP	Med-Fn SAND.			
S#18	170-180		SP	Med-Fn Sand little coarse sand and fine gravel.			
S#19	180-190		SP	Med-Fn Sand w/ trace gravel. Med to fine gravel	change at 182.5'		
			GP	with coarse sand at 187.5'			
S#20	190-200		GP	coarse-med SAND and gravel (well rounded) becoming med to coarse gravel at 200 ft.			

FIELD BORING LOG			BORING NO. <i>PBM-90-010</i>		
PROJECT NO.: 6296-11		PROJECT NAME: USATHAMA- BAAP FS		PAGE <i>4</i> OF <i>4</i>	
DRILLING CONTRACTOR: LAYNE SOUTHWEST		DRILLER: <i>G. Rodriguez</i>		DATE STARTED <i>8/23</i> COMPLETED <i>8/24</i>	
METHOD: DUAL WALL		CASING SIZE: 9 IN.		TIP #V: <i>HE#2</i> PROTECTION LEVEL: <i>D</i>	
GROUND ELEV.:		SOIL DRILLED: <i>2120'</i>		WATER LEVEL: <i>86.0</i> TOTAL DEPTH: <i>217.0'</i>	
LOGGED BY: <i>J Buss</i>		CHECKED BY: <i>P. Bolmer</i>		DATE: <i>9/24/90</i>	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
<i>S#21</i>	<i>200-210</i>		<i>SP</i>	<i>crse gravel + cobbles well rounded with, true med-fine gravel.</i>			
					<i>Change ~210</i>		
<i>S#22</i>	<i>210-220</i>		<i>SP</i>	<i>med crse to fn SAND wt/ some gravel.</i>			
				<i>bedrock - fn Silty brown Sandstone -</i>	<i>change at 215 217</i>		
				<div style="border: 1px solid black; padding: 5px; display: inline-block;"> <i>No water added to this hole</i> </div>			

FIELD BORING LOG

BORING NO. DBM-90-02D

PROJECT NO.: 6296-11	PROJECT NAME: USATHAMA- BAAPFS	PAGE 1 OF 2
DRILLING CONTRACTOR: LAYNE SOUTHWEST	DRILLER: G. Rodriguez	DATE STARTED 8/13 COMPLETED 8/19
METHOD: DUAL WALL	CASING SIZE: 9 IN.	TIP GV: TE#2 PROTECTION LEVEL: D 6/8/19
GROUND ELEV.:	SOIL DRILLED: 20210	WATER LEVEL: 79.85 ft TOTAL DEPTH: 210
LOGGED BY: J Buss	CHECKED BY: JAD P. Bolmer	DATE: 8/13 9/28/90

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S#1	0-10			SPSM Topsoil over brown med. fn. Sand trace silt and gravel	little cuttings return.		
S#2	10-20			SP brn med-fn SAND			
S#3	20-30			SP tan med-fn SAND trace gravel			
S#4	30-40			SP med-fn SAND, with fine gravel layer at 35 ft.			
S#5	40-50			SP med-fn SAND, gravel layers from 45-50 ft.			
S#6	50-60			SP tan med-fn SAND with trace silt and gravel.			
S#7	60-70			SP tan med-fine Sand trace gravel.			
S#8	70-80			SPSM tan med-fn Sand w/ trace gravel thin, cemented silt zone at ~75 ft with water table, some coarse gravel below water table to 80 ft.	change at 75' (thin silt bed)		
S#9	80-90			SP tan-gray med-fn SAND w/ trace to little gravel			

FIELD BORING LOG			BORING NO. PBM-90-020		
PROJECT NO.: 6298-11		PROJECT NAME: USATHAMA- BAAP FS		PAGE 2 OF 2	
DRILLING CONTRACTOR: LAYNE SOUTHWEST		DRILLER: G. Rodriguez		DATE STARTED 8/17/90 COMPLETED 8/19	
METHOD: DUAL WALL		CASING SIZE: 9 IN.		TIP #V: TE#2 PROTECTION LEVEL: D	
GROUND ELEV.:		SOIL DRILLED: 214		WATER LEVEL: 29.8 TOTAL DEPTH: 214	
LOGGED BY: J. Buss		CHECKED BY: P. Bohrer		DATE: 8/17-18/90	

→ 9/26/90

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S#10	90-100		SP-GP	90-95 ft Med-Fn SAND wt little gravel. 95 ft. crse sand and 5n gravel becoming coarser at 100 ft.	change at 95 ft		
S#11	100-110		SP	med-Fn sand wt crse sand & little gravel.			
S#12	110-120		SP	similar to S#11			
S#13	120-130		SP	similar to S#11			
S#14	130-140		SP	similar to S#11			
S#15	140-150 140-150		SP	similar to S#11			
S#16	150-160		SP	med-Fn sand with crse sand. More gravel at 155 ft. Fine gravel.			
S#17	160-170			crse-fine sand wt little gravel			
S#18	170-180		SP	similar to S#17			
S#19	180-190		SP-GP	180-185 similar to S#17 185-190 crse gravel & cobbles.	change at 185		
S#20	190-200		GP	Very crse gravel and cobbles at 195 ft.			
S#21	200-210		GP-SP	200-205 gravel/cobble zones 205-214 med-crse sand with some gravel.			

FIELD BORING LOG				BORING NO. PBM-90-03D	
PROJECT NO.: 6296-11		PROJECT NAME: USATHANA- BAAP FS		PAGE 1 OF 3	
DRILLING CONTRACTOR: LAYNE SOUTHWEST		DRILLER: G. Rodriguez		DATE STARTED 8/7/90 COMPLETED 8/16/90	
METHOD: DUAL WALL		CASING SIZE: 9 IN		TIP NO: TE #2	
GROUND ELEV.:		SOIL DRILLED: 205.0'		WATER LEVEL: 72.7' (max)	
				TOTAL DEPTH: 205.0'	
LOGGED BY: C. Moore		CHECKED BY: P. Bolmer		DATE: 8/7/96	

USCS

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEX.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-1	surface	NA	SP	Organic topsoil		0	
S-2	10'	NA	SP	Brown, fine to med sand, poorly graded, damp			
S-3	20'	"	SP	Same as above			
S-4	30'	"	SP	Brown, fine to med sa, trace gravel			
S-5	40'		SP	Tan, fine to med sa, trace coarse sa and gr., damp	Note: no hammer needed to drive pipe - very soft		
S-6	50'		SP	Same as above			
S-7	60'		SP	Tan, fine to med sa, poorly graded, damp			
S-8	70'		SP	Same as above			
S-9	80'		SW	Brown, med sa with some gr., well rounded, well graded (all sizes, colors), moist	change @ ↓ ~ 75'	0	

FIELD BORING LOG				BORING NO. PBM-90-03D	
PROJECT NO.: 6296-11		PROJECT NAME: USATHAMA- BAAPFS		PAGE 2 OF 3	
DRILLING CONTRACTOR: LAYNE SOUTHWEST		DRILLER: G Rodriguez		DATE STARTED 8/7/90	COMPLETED 8/16/90
METHOD: DUAL WALL	CASING SIZE: 9 IN.	TIP #V: TE #2	PROTECTION LEVEL: D		
GROUND ELEV.:	SOIL DRILLED: 205.2	WATER LEVEL: 72.7'	TOTAL DEPTH: 2050		
LOGGED BY: C Moore		CHECKED BY: P. Bolmer		DATE: 8/7/90	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			REC.			TIP	LEL
S-10	90'		SW	Brown, fine to med sa w/ little to some coarse sa & gravel - wet	(producing a lot of water)		
S-11	100'		SP	Brown, fine to med sa w/ little gravel - wet	still very soft		
S-12	110'		SP	Tan, fine to med sa w/ trace of gravel, dryer than above	↓		
S-13	120'		SP	Brown, fine to med sa w/ some coarse sand, trace gr., saturated			
S-14	130'		SP	Same as above			
S-15	140'		SP	Same, with slight increase in coarse fraction	Change @ around 145'		
S-16	150'		SW	Brown, fine to med sa with some coarse sand & some gravel (definitely more gravel than above). Variegated in size and color			
S-17	160'		SP SW	Same as above w/ decrease in gravel			
S-18	170'		SW	Same as above			

FIELD BORING LOG				BORING NO. PBM-90-03D	
PROJECT NO.: 6298-11		PROJECT NAME: USATHAMA- BAAPFS		PAGE 3 OF 3	
DRILLING CONTRACTOR: LAYNE SOUTHWEST		DRILLER: G. Rodriguez		DATE STARTED 8/7/90	COMPLETED 8-16/90
METHOD: DUAL WALL	CASING SIZE: 9 IN.	TIP W: TE#2		PROTECTION LEVEL: 0	
GROUND ELEV.:	SOIL DRILLED: 205.0'	WATER LEVEL: 72.7'		TOTAL DEPTH: 205.0'	
LOGGED BY: C. Moore		CHECKED BY: P. Botkin		DATE: 8/16/90 8/16/90 9/28/90	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
						TIP	LEL
				bore hole relocated ~ 75' east after difficulties with heaving sands.			
S-19	180			SP Fine-med Sand with trace little gravel 0-90 ft			
S-20	190			GP gravel cobble zone 90-95 ft.			
S-21	200			SP Fine med sand w/trace-little gravel 95-183 ft.			
S-22	205			GP Gravel cobble zone 183-200 ft			
				SP Fine-med sand 200-205 ft bedrock at 205 ft.			
				BOE = 205 ft.			
				~ 800 gal. H ₂ O added to this boring.			

FIELD BORING LOG			BORING NO. PSN-90-04B		
PROJECT NO.: 6298-11		PROJECT NAME: USATHAMA- BAAP FS			PAGE 1 OF 2
DRILLING CONTRACTOR: LAYNE SOUTHWEST		DRILLER: G. Rodriguez		DATE STARTED 8/6/90	COMPLETED 8/6/90
METHOD: DUAL WALL	CASING SIZE: 9 IN.	TIP GV: TE 100		PROTECTION LEVEL: D	
GROUND ELEV.:	SOIL DRILLED: 130'	WATER LEVEL: 90.5		TOTAL DEPTH: 130'	
LOGGED BY: P. Bolmer		CHECKED BY: P. Bolmer		DATE: 9/28/90	

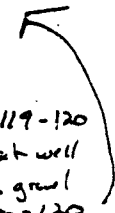
SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	L.S.C.S.		DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			PER.	REC.			TIP	LEL
S-1	Surface	NA	SP		Brown med to fi ss, trc, organic, poorly graded, damp			
S-2	10'		SP		Brown med to fi ss, trc poorly graded, damp			
S-3	20'		SP		Tan med to fi ss, Trc, Tr fi gravel poorly graded, damp			
S-4	30'		SP		Tan fi to med ss, Trc, poorly graded, damp			
S-5	40'		SP		As above			
S-6	50'		SP		As above			
S-7	60'		SP		Tan med to fi ss, trc, poorly graded, damp			
S-8	70'		SP		Tan med to fi ss, trc, poorly graded, damp to moist			
S-9	80'		SP		As above w/ incrt in moisture			
S-10	90'		SP		As above			
S-11	100'		SW		Tan Sandy gravel, ss is med to fi Trc, gravel is well rounded, poorly graded	At 96' incrt 1-2 coarse		

FIELD BORING LOG

BORING NO. PBN-90-041B

PROJECT NO.: 0290-11	PROJECT NAME: USATHANA- BAAP FS	PAGE 2 OF 2
DRILLING CONTRACTOR: LAYNE SOUTHWEST	DRILLER: G. Rodriguez	DATE STARTED 5/6/90 COMPLETED 8/6/90
METHOD: DUAL WALL	CASING SIZE: 9 IN.	TIP GV: TE 100 PROTECTION LEVEL: D
GROUND ELEV.:	SOIL DRILLED: 130'	WATER LEVEL: 90.5 TOTAL DEPTH: 130'
LOGGED BY: P. Bolmer	CHECKED BY: P. Bolmer	DATE: 9/28/90

UCS

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	REV. REC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
						TIP	LEL
S-12	110'	NA	GP	Unconsolidated, Gravelly sand, ss is med to c. to fi ss, poorly graded, Gravel is well rounded, saturated	<p>  DE ≈ 119-120 going to sit well in this gravel zone 110-120 </p> <p> going over now joint to confirm stratigraphic Δ </p>		
S-13	120'		SW GP	Tan sandy gravel, ss is med to c. to fi, poorly graded, Gravel is well rounded, saturated			
S-14	130'		SP	Tan med to fi ss, Tr c, poorly grade, saturated			
				BOB @ 130'	0.550 add ≈ 460 gals 1040 add ≈ 300 gals		

FIELD BORING LOG			BORING NO. PBN-90-040		
PROJECT NO.: 6298-11		PROJECT NAME: USATHAMA- SAAP FS		PAGE 1 OF 4	
DRILLING CONTRACTOR: LAYNE SOUTHWEST		DRILLER: G. Rodriguez		DATE STARTED 6/2/90 COMPLETED 5/5/90	
METHOD: DUAL WALL		CASING SIZE: 9 IN		TIP NO: TE 100 PROTECTION LEVEL: D	
GROUND ELEV.:		SOIL DRILLED: 237.0'		WATER LEVEL: 90.60 bgs TOTAL DEPTH: 237.0'	
LOGGED BY: P. Bolmer		CHECKED BY: P. Bolmer		DATE: 9/28/90	

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	USCS		COMMENTS ON ADVANCE OF BORING	MONITORING	
			PER	REC.		TIP	LEL
S-1	Surface	NA	SP		Dark brown med to fi sand, Tr fi gr, poorly graded, damp SP $\Delta e \approx 3'$		
S-2	10'		SP		Tan to light tan Fi med Tr sand, Tr fi gr, poorly graded, damp		
S-3	20'		SP		As above		
S-4	30'		SP		As above w/ inc in grad $\approx 28'$		
S-5	40'		SP		Tan to light + Fi sa, Tr med s, poorly g, dan, beach sand		
S-6	50'		SP		Tan med to Fi sa, Tr fi gr, poorly graded, damp to moist		
S-7	60'		SP		Tan med to Fi sa, Tr s, poorly graded, damp to moist		
S-8	70'		SP		Tan med to Fi sa, poorly graded damp to moist		

FIELD BORING LOG			BORING NO. PBN-90-040		
PROJECT NO.: 6298-11		PROJECT NAME: USATHANA- BAAP FS		PAGE 2 OF 4	
DRILLING CONTRACTOR: LAYNE SOUTHWEST		DRILLER: G. Rodriguez		DATE STARTED 8/2/90 COMPLETED 8/5/90	
METHOD: DUAL WALL		CASING SIZE: 9 IN		TIP Ø: TE 10.0 PROTECTION LEVEL: 0	
GROUND ELEV.:		SOIL DRILLED: 237.0'		WATER LEVEL: 90.60 bas TOTAL DEPTH: 237.0'	
LOGGED BY: P. Bolmer		CHECKED BY: P. Bolmer		DATE: 9/28/90	

USCS

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	REV. REV.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
						TIP	LEL
S-9	80'	NA	SP	Similar to S-8 w/ r/c in Fi sa			
S-10	90'	NA	SP	As above	ΔE 95'		
S-11	100'			PLB Ten med to Fi sa, fine, some coarse Ten sandy gravel, sa is med to fi, tr c sa, poorly graded, moist	90.6' - 9/3/90 w/probe		
S-12	110'		GP	Gravelly Sand, sa is med to Fi, tr c well graded, saturated End of Day	ΔE 104'		
S-13	120'		SW	Variegated Gravelly Sand, sa is med w/ some Fi sa, poorly graded, saturated	ΔE 122'		
S-14	130'		SP/SW	Ten med to Fi sa, some coarse, moderately to well graded, saturated			
S-15	140'		SW	Ten med to Fi sa some coarse, well graded, Tr Fi gr saturated			
S-16	150'		SP	Ten med to Fi sa, little coarse, moderately graded, saturated			

FIELD BORING LOG

BORING NO. PBW-90-040

PROJECT NO.: 6296-11

PROJECT NAME: USATAMA - SAAP FS

PAGE 3

OF 4

DRILLING CONTRACTOR: LAYNE SOUTHWEST

DRILLER: G. Rodriguez

DATE STARTED 8/3/90

COMPLETED 5/5/90

METHOD: DUAL WALL

CASING SIZE: 9 IN.

TIP W: TE 10.0

PROTECTION LEVEL: D

GROUND ELEV.:

SOIL DRILLED: 2320'

WATER LEVEL: 90.60' bgs

TOTAL DEPTH: 2320'

LOGGED BY: P. Bolmer

CHECKED BY: P. Bolmer

DATE: 9/25/90

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 4-INCHES	PEN. REC.		DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
			PEN.	REC.			TIP	LEL
S-17	160'	NA	SP		tan med to Tr & Tr c, poorly graded, saturated	Adding H ₂ O ≈ 600 gals Slightly screen on wire - no readings on TE		
S-18	170'		SP		as above	0.920 - Adding H ₂ O ≈ 500 gals		
S-19	180'	*	GW		Ungraded Gravelly Sand, some is med to fi, mostly fine to med some coarse sc, probably well graded, saturated	1000 - added ≈ 500 gals 1600 - added ≈ 300 gals 1615 - added ≈ 300 gals	Δ @ 180'	
S-20	190'		SP		Ungraded sandy gravel, some med to fi, mostly fine to med some coarse relatively well graded , saturated	Added ≈ 300 gals		
S-21	200'	*	GW		Ungraded gravelly sand, some is med to fi w/ some coarse, well graded, gravel is fi to coarse well graded saturated	Added ≈ 300 gals		
S-22	210'		GW		As above	Added ≈ 300 gals		
S-23	220'		GW		As above	Added ≈ 300 gals		

FIELD BORING LOG				BORING NO. PDN-90-040	
PROJECT NO.: 6298-11		PROJECT NAME: USATHAMA- BAAPFS		PAGE 4 OF 4	
DRILLING CONTRACTOR: LAYNE SOUTHWEST		DRILLER: G. Rodriguez		DATE STARTED 8/2/90 COMPLETED 8/5/90	
METHOD: DUAL WALL		CASING SIZE: 9 IN.		TIP ON: TE 100 PROTECTION LEVEL: 0	
GROUND ELEV.:		SOIL DRILLED: 2320'		WATER LEVEL: 90.60 TOTAL DEPTH: 2320'	
LOGGED BY: P. Bolmer		CHECKED BY: P. Bolmer		DATE: 9/28/90	

USCS

SAMPLE NO.	DEPTH IN FEET	BLOWS PER 6-INCHES	PEN/SEC.	DESCRIPTION	COMMENTS ON ADVANCE OF BORING	MONITORING	
						TIP	LEL
S-24	230'		SP	Tan Meel to Fi s, Tr c, poorly to moderately graded, saturated	de ≈ 234		
S-25	236		SP	Tan med to Fi s, some coarse, well graded, saturated	Rock at ≈ 236'		
				BOB @ 237 ..	Total water ≈ 3400 gals		

R₃ 2

FIELD BORING LOG				Boring No. SWN-91-01B	
Project No 6853-03		Project Name BAAP RI/FS		Page 1 of 1	
Contractor Lyrne Eng'g		Driller Art R		Date started 10/15 completed 10/15	
Method Dual wall		Casing Size 9" OD		HNU 11.7/10.2 TIP #5 Protection Level D	
Ground El.		Soil Drilled 120'		± below ground 25' Total Depth 120'	
Logged by Calby		Checked by DRP		Date 10/16/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		
						HNU	LEL	
see SWN-91-01D	0-10			Tan Med-crs sand some thin layers of gravel (SP) ↓		JAR	ATR	0%
	10-20					0	0	
	20-30					↓	↓	↓
	30-40					↓	↓	↓
	40-50					↓	↓	↓
	50-60							
	60-70							
	70-80				± 85'			
	80-90				15			
	90-100			Gravel, cobbles + crs sand (SP-GP)				
	100-110				115'			
	110-120			Med-crs sand (SP)	BoE 120'			

FIELD BORING LOG				Boring No. SWN-91-012	
Project: No 6853-03		Project Name BIAF RE/ES		Page 1 of 1	
Contractor Bayne Environ.		Driller Art R		Date started 10/16 completed 10/16	
Method Dual Wall		Casing Size 9" OD		HNU 11.7/10.2 TRd5 Protection Level D	
Ground El. 62.55		Soil Drilled 170'		2' below ground 85' Total Depth 170'	
Logged by Calby		Checked by DRP		Date 10/17/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		
						HNU	LEL	
522 SWN-91-01D	0-10			Fine-crs SAND some cobbles (SP-CP)	7'	JAR	ATM	0%
	10-20			FAU Fine-Med Sand		0	0	
	20-30			Some thin layers of gravel (SP)	35'	↓	↓	↓
	30-40							
	40-50			Med-crs SAND				
	50-60			Some thin layers of gravel (SP)				
	60-70				85'			
	70-80							
	80-90							
	90-100			crs SAND Cabbles + Gravel (SP-CP)	95'			
	100-110				112'			
	110-120			Med-crs sand (SP)				
	120-130			↓	BOE 170'			
	130-140							
	140-150							
	150-160							
	160-170							

FIELD BORING LOG				Boring No. SWN-4-00	
Project No. 6953-03		Project Name BAAP RI/FS		Page 1 of 1	
Contractor Lynne		Driller A. R.		Date started 10/14 completed 10/14	
Method Dual-Wall Hammer		Casing Size 4" OD	MNU 11.7/10.2 TIP#5	Protection Level D	
Ground El.		Soil Drilled 220'	± below ground 85'	Total Depth 220'	
Logged by Bubs Colby		Checked by DRP		Date 10/15/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		
						MNU	LEL	
S-1	0-10			Fine-crs SAND some cobbles (SP-GP)	7'	JAR	ATR	0%
S-2	10-20			TAN Fine-Mod SAND		Q	Q	
S-3	20-30			Some thin layers of gravel	33'			
S-4	30-40			Med-crs SAND				
S-5	40-50			Some thin layers of gravel (SP)				
S-6	50-60							
S-7	60-70							
S-8	70-80				85' VOA 90'			
S-9	80-90							
S-10	90-100				95'			
S-11	100-110			Crs SAND Gravel + cobbles (SP-GP)	110' VOA 115'			
S-12	110-120			Med-crs sand (SP)				
S-13	120-130							
S-14	130-140							
S-15	140-150							
S-16	150-160				160'			
S-17	160-170			Fine-Mod SAND (SP)	170'			
S-18	170-180			Med-crs SAND w/some gravel + cobbles mixed in (SP)	195'			
S-19	180-190							
S-20	190-200			Med-crs sand (SP)				
S-21	200-210			Some thin gravel layers				
S-22	210-220				BOE 220'			

FIELD BORING LOG				Boring No. <i>SW-91-02C</i>	
Project No. <i>653-03</i>		Project Name <i>BAAP RI/ES</i>		Page <i>1</i> of <i>1</i>	
Contractor <i>Layne Env.</i>		Driller <i>Art R</i>		Date started <i>10/22</i> completed <i>10/22</i>	
Method <i>Dual Drill</i>		Casing Size <i>1" OD</i>		HNU <i>11.7/10.2 #5</i> Protection Level <i>0</i>	
Ground El.		Soil Drilled <i>160'</i>		<i>±</i> below ground <i>85'</i> Total Depth <i>160'</i>	
Logged by <i>Calby</i>		Checked by <i>DRP</i>		Date <i>10/25/91</i>	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
<i>See SW-91-02D</i>	0 - 10			organics cobbles, gravel + cos sand (SP-GP)	0'	<i>JAR</i>	<i>ATR</i> 0%
	10 - 20			Fine - med cos sand poorly	10'	0	0
	20 - 30			sorted some thin		↓	↓
	30 - 40			layers of gravel		↓	↓
	40 - 50			(SP)			
	50 - 60			↓			
	60 - 70						
	80 - 90				<i>±</i> 85'		
	90 - 100				95'		
	100 - 110			Gravel Cobbles + cos sand			
	110 - 120			(SP-GP)			
	120 - 130			Med - cos sand	115'		
	130 - 140			(SP)			
	140 - 150			↓			
	150 - 160				BOE 160'		

FIELD BORING LOG				Boring No. <i>SWH-91-03</i>	
Project No <i>6853-03</i>		Project Name <i>BAAP R1/FS</i>		Page <i>1</i> of <i>1</i>	
Contractor <i>Layne</i>		Driller Act <i>R</i>		Date started <i>10/8</i> completed <i>10/8</i>	
Method <i>Hand-Driven Hammer</i>		Casing Size <i>9" OD</i>		HNU <i>11.7/10.2</i> TIP # <i>5</i>	
Ground El.		Soil Drilled <i>120'</i>		Protection Level <i>D</i>	
		<i>±</i> below ground <i>55</i>		Total Depth <i>120'</i>	
Logged by <i>Colby</i>		Checked by <i>DRP</i>		Date <i>10/10/91</i>	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-1	0-10			Brown/Tan Fine-Crs SAND		<i>0</i>	<i>0</i>
S-2	10-20			Poorly sorted		<i>0</i>	<i>0</i>
S-3	20-30			some thin layers of fine gravel		<i>0</i>	<i>0</i>
S-4	30-40			(SP)		<i>0</i>	<i>0</i>
S-5	40-50					<i>0</i>	<i>0</i>
S-6	50-60			Tan Md-Crs SAND		<i>0</i>	<i>0</i>
S-7	60-70			Poorly sorted		<i>0</i>	<i>0</i>
<i>See SWH-91-03C</i>	70-80			Some thin layers of gravel.	<i>~ 85'</i>	<i>0</i>	<i>0</i>
	80-90			(SP)		<i>0</i>	<i>0</i>
	90-100					<i>0</i>	<i>0</i>
	100-110					<i>0</i>	<i>0</i>
	110-120					<i>0</i>	<i>0</i>
				Crs sand + Gravel some cobbles (SP-GP)	<i>105'</i>	<i>0</i>	<i>0</i>
				Tan Md-Crs SAND	<i>112-115</i>	<i>0</i>	<i>0</i>
				(SP)	<i>- BOE 120'</i>	<i>0</i>	<i>0</i>
				↓		<i>0</i>	<i>0</i>
				<u>B.O.E. 120'</u>		<i>0</i>	<i>0</i>

FIELD BORING LOG				Boring No. <u>SWN-91-03C</u>	
Project No <u>6853-03</u>		Project Name <u>BAA P R/E</u>		Page <u>1</u> of <u>2</u>	
Contractor <u>Layne</u>		Driller <u>A.1 R</u>		Date started <u>10-2-91</u> completed <u>10-2-91</u>	
Method <u>Direct-Well Hammer</u>		Casing Size <u>9" OD</u>		MNU <u>11.7/10.2</u> T12#14 Protection Level <u>D</u>	
Ground El.		Soil Drilled <u>165'</u>		2' below ground <u>85</u> Total Depth <u>170'</u>	
Logged by <u>Bhks</u>		Checked by		Date	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						MNU	LEL
500 SWN-91-03C	0-10			Brown-Tan Fine-Med-Crs SAND		JAR	0%
	10-20			Poorly sorted		Q	0
	20-30			some thin layers of fine gravel			
	30-40			(SP)			
	40-50			Tan Med-Crs Sand			
5-6	50-60			Poorly sorted			
5-7	60-70			Some thin layers of gravel	Σ ~ 85'		
5-8	70-80						
5-9	80-90						
5-10	90-100			crs sand, gravel + cobbles	100'		
5-11	100-110			(SP-GP)			
5-12	110-120				114		
5-13	120-130			Tan Med-Crs SAND			
5-14	130-140			(SP)			
5-15	140-150						
5-16	150-160						
5-17	160-170				- BOE 170'		

FIELD BORING LOG				Boring No. SWN-91-030	
Project No 6853-03		Project Name BMP RI/F3		Page 1 of 1	
Contractor Lays		Driller A. Rodriguez		Date started 10/1/91 completed 10/1/91	
Method Hammer		Casing Size 9" OD	HNU 11.7/10.2 T12#5	Protection Level D	
Ground El.		Soil Drilled 210'	2' below ground 85'	Total Depth 210'	
Logged by Blake Colby		Checked by DRP		Date 10/10/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		
						HNU	LEL	
0-10	SWN-91-030			Brown-Tan Fine-Med-crs Sand. Poorly sorted	- ~ 85'	0	0	0%
10-20				some thin layers of fine gravel (SP)		↓	↓	↓
20-30								
30-40								
40-50								
50-60				Tan Med-crs sand				
60-70				Poorly sorted				
70-80				some thin layers of gravel (SP)				
80-90								
90-100								
100-110				crs sand + gravel some cobbles (SP-GP)				
110-120								
120-130				Tan Med-crs sand				
130-140				(SP)				
140-150								
150-160								
160-170								
170-180	5-20			crs sand, gravel + cobbles (SP-GP)	- BOE 209'			
180-190	5-19							
190-200	5-20			Tan crs sand (SP)				
200-210	5-21			Dolomite Bedrock 209'				

FIELD BORING LOG				Boring No. SWN-91-03E	
Project No. 6853-03		Project Name BAAP RI/ES		Page 1 of 1	
Contractor LAYNE ENV.		Driller A. RODRIGUEZ		Date started 11/8/91 completed 11/10/91	
Method Dual-Wall/Rot.	Casing Size 9"	HNU 11.7/10.2	Protection Level D		
Ground El.	Soil Drilled 210'	± below ground	Total Depth 258'		
Logged by R. Pender		Checked by C. K. F.		Date 11-11-91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
See SWN-91-03D Boring Log Six (6) samples of bedrock cuttings collected.	0-10			Brown med. sand, tr. silt and coarse sand, poorly graded (SP).		JAR	ATK
	10-100			Tan med. sand, some fine sand, coarse sand and fine gravel, occasional cobble, poorly graded (SP).	± ~ 85 ft.	BKC	
	100-110			Tan med.-crs. sand and fine gravel, some med.-crs. gravel, a few cobbles, poorly graded (SP-GP).			
	110-170			Tan med. sand, some fine and coarse sand, tr. fine gravel, poorly graded (SP).			
	170-180			Tan crs. sand and fine gravel, some med. sand and crs. gravel, poorly graded (SP-GP).			
	180-210			Tan med.-crs. sand, tr. fine-med. gravel, poorly graded (SP).			
	210-220			Blue-Gray Dolomite Bedrock			
	220-235			Tan-Brown Sandstone			
	235-258			Blue-Gray Dolomite			
				B.O.E. 258 feet			

FIELD BORING LOG				Boring No. SWN-91-03X	
Project No. 6853-03		Project Name BAAP R/F/S		Page 1 of 1	
Contractor Layre Env.		Driller A. Rodriguez		Date started 10/26/91 completed 11/7/91	
Method Triple Wall		Casing Size 10 3/4"		HNU 11.7/10.2 Protection Level D	
Ground El.		Soil Drilled 210'		± below ground 85' Total Depth 230'	
Logged by Colby		Checked by DRP		Date 11/10/91	

BORING ABANDONED

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
See SWN-91-03D Boring Log	0-10			Organic matter, gravel and coarse sand. (SP-GP)		JAR	0%
	10-210			Tan, fine-coarse sand, some thin gravel layers. (SP)		↓	↓
	210-220			Blue-gray dolomite. BEDROCK			
	220-230			Sand and gravel, outwash. Possibly a fault or fracture filled by outwash. (SP-GP)			
				<u>B.O.E. 230 feet</u>			
				BORING ABANDONED ON 11/07/91			

FIELD BORING LOG				Boring No. <u>SWN-91-04C</u>	
Project No <u>6853</u>		Project Name <u>BAAP RI/FS</u>		Page <u>1</u> of <u>1</u>	
Contractor <u>Layne</u>		Driller <u>Act R</u>		Date started <u>10/13</u> completed <u>10/13</u>	
Method <u>Double-Hill</u>		Casing Size <u>9" OD</u>		HNU <u>11.7/10.2</u> Protection Level <u>D</u>	
Ground El		Soil Drilled <u>170'</u>		<u>±</u> below ground <u>85</u> Total Depth <u>170'</u>	
Logged by <u>Calby</u>		Checked by <u>DRP</u>		Date <u>10/14/91</u>	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		
						HNU	LEL	
see SWN-91-04D	0-10			Tan Med-Crs Sand w/ thin layers of gravel (SP) ↓		JAR	ATK	0.8'
	10-20					0	0	
	20-30					↓	↓	↓
	30-40							
	40-50							
	50-60							
	60-70							
	70-80							
	80-90							
	90-100			Gravel, Crs SAND + cobbles (SP-GP)	17'			
	100-110							
	110-120			Tan Med-Crs Sand (SP) ↓ B.O.E. 170'	112'			
	120-130							
	130-140							
	140-150							
	150-160							
	160-170							

FIELD BORING LOG				Boring No. <u>FW-41-240</u>	
Project No <u>6553-03</u>		Project Name <u>BAAP RI/FS</u>		Page <u>1</u> of <u>1</u>	
Contractor <u>Layne</u>		Driller Art <u>R</u>		Date started <u>10/9</u> completed <u>10/9</u>	
Method <u>Hammer</u>		Casing Size <u>9" OD</u>		HNU <u>11.7/10.2 T10#5</u> Protection Level <u>D</u>	
Ground El.		Soil Drilled <u>200'</u>		<u>±</u> below ground <u>95'</u> Total Depth <u>200'</u>	
Logged by <u>Guths Call</u>		Checked by <u>DRP</u>		Date <u>10/10/91</u>	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		
						HNU	LEL	
S-1	0-10			Tan Md-crs SAND		JAR	ATP	0%
S-2	10-20			Some thin layers of gravel		0	0	
S-3	20-30							
S-4	30-40			(SP)				
S-5	40-50							
S-6	50-60							
S-7	60-70							
S-8	70-80							
S-9	80-90				<u>~ 85'</u>			
S-10	90-100			crs SAND Gravel +	95'			
S-11	100-110			and cobbles (SP-GP)	115'			
S-12	110-120			Tan Md-crs Sand				
S-13	120-130			Some thin layers of gravel				
S-14	130-140			(SP)				
S-15	140-150							
S-16	150-160							
S-17	160-170				170'			
S-18	170-180			crs sand, gravel + cobbles				
S-19	180-190			(SP-GP)	195'			
S-20	190-200			Tan crs Sand	30E 200'			
				(SP)				
				Dolomite Bedrock				
				~ 210'				

FIELD BORING LOG				Boring No. <i>SWN-91-058</i>	
Project No. <i>6553-03</i>		Project Name <i>BAAP RI/FS</i>		Page <i>1</i> of <i>1</i>	
Contractor <i>Layne Environ</i>		Driller <i>Art R</i>		Date started <i>10/12/91</i> completed <i>10/12/91</i>	
Method <i>Hand-Held Hammer</i>		Casing Size <i>4" OD</i>		HNU <i>11.7/10.2 Tipts</i> Protection Level <i>D</i>	
Ground EL		Soil Drilled <i>120'</i>		<i>2'</i> below ground Total Depth <i>120'</i>	
Logged by <i>Cathy Gruney</i>		Checked by <i>DRP</i>		Date <i>10/14/91</i>	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
<i>see SWN-91-05D</i>	<i>0-10</i>			<i>Tan Fine-Med Sand w/ thin layers of cgs sand or thin gravel (SP)</i>		<i>JAR</i>	<i>AIR</i>
	<i>10-20</i>					<i>0</i>	<i>0%</i>
	<i>20-30</i>					<i>↓</i>	<i>↓</i>
	<i>30-40</i>					<i>↓</i>	<i>↓</i>
	<i>40-50</i>					<i>↓</i>	<i>↓</i>
	<i>50-60</i>			<i>↓</i>			
	<i>60-70</i>						
	<i>70-80</i>						
	<i>80-90</i>				<i>Σ 85'</i>		
	<i>90-100</i>			<i>Gravel, cgs sand + cobbles (SP-GP)</i>	<i>98'</i>		
	<i>100-110</i>				<i>115</i>		
	<i>110-120</i>			<i>Med-cgs Sand (SP)</i> <i>↓</i>	<i>BoE 120'</i>		

FIELD BORING LOG				Boring No. <i>SNN-91-051</i>	
Project No <i>6953-03</i>		Project Name <i>BAMP RI/FS</i>		Page <i>1</i> of <i>1</i>	
Contractor <i>Wayne</i>		Driller <i>Art R</i>		Date started <i>10/11/91</i> completed <i>10/12/91</i>	
Method <i>H. Pilot-Drill</i>		Casing Size <i>2" OD</i>		HNU <i>11.7/10.2 TIP+5</i> Protection Level <i>0</i>	
Ground El.		Soil Drilled <i>170'</i>		<i>2'</i> below ground <i>85'</i> Total Depth <i>170'</i>	
Logged by <i>Bubbs Colby</i>		Checked by <i>DRP</i>		Date <i>10/13/91</i>	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring		
						HNU	LEL	
<i>See SNN-91-051</i>	<i>0-10</i>			<i>Tan Fine-Med SAND w/ some thin layers of gravel (SP)</i>		<i>0</i>	<i>0</i>	<i>0.5</i>
	<i>10-20</i>							
	<i>20-30</i>							
	<i>30-40</i>							
	<i>40-50</i>							
	<i>50-60</i>			<i>Gravel, Cobbles + ccs Sand (SP-GP)</i>				
	<i>60-70</i>							
	<i>70-80</i>							
	<i>80-90</i>							
	<i>90-100</i>							
	<i>100-110</i>			<i>Med-crs Sand (SP)</i>				
	<i>110-120</i>							
	<i>120-130</i>							
	<i>130-140</i>							
	<i>140-150</i>							
	<i>150-160</i>			<i>Med-crs Sand (SP)</i>				
	<i>160-170</i>							

FIELD BORING LOG				Boring No. SW-91-053	
Project No. 6853-03		Project Name BAAP RI/F5		Page 1 of 1	
Contractor Layne		Driller Art R		Date started 10/10 completed 10/10	
Method Hammer		Casing Size 9" OD		HNU 11.7/10.2 TIP #5 Protection Level D	
Ground El		Soil Drilled 202'		2' below ground 85' Total Depth 202'	
Logged by Binky Culley		Checked by DRP		Date 10/11/91	

Sample No	Depth in Feet	Blows per 6 inches	Pen Rec	Description	Comments on Advance of Boring	Monitoring	
						HNU	LEL
S-1	0-10			Tan Fine-Med SAND Some thin gravel layers (SP) ↓		JAR	0%
S-2	10-20					O	
S-3	20-30						
S-4	30-40						
S-5	40-50						
S-6	50-60						
S-7	60-70						
S-8	70-80						
S-9	80-90						
S-10	90-100						
S-11	100-110			Gravel Cobbles + Cos Sand (SP-GP)	95' - Voc samples 100'		
S-12	110-120			Med. cos SAND (SP)	115' - Voc samples 110'		
S-13	120-130						
S-14	130-140				150'		
S-15	140-150			Gravel + cobbles w/ cos SAND (SP-GP)	160'		
S-16	150-160			cos SAND some fine gravel			
S-17	160-170						
S-18	170-180				195'		
S-19	180-190			gravel, cos sand + cobbles SP-SP			
S-20	190-200				BOE 202'		



ENGINEERING INC

LOG OF TEST BORING

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
Location N484,732.21 E2,064,450.61

Boring No.S1101

Surface Elevation 828.20

Job No.C 8742

Sheet 1 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

[illegible]

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
 Location N484,732.21 E2,064,450.61

Boring No. S1101
 Surface Elevation 828.24
 Job No. C 8742
 Sheet 2 of 2

1408 EMIL STREET • P.O. BOX 9636, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture				*	% Gravel	% Sand	% P200	LL	PI
No.	Type	↓	↓	N	Depth							
D0002	2SS	X	M	53	50							
					55							
					60	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
					65							
					70							
					75							
D0003	2SS	X	W	46	80	End Boring at 80'	1	94	5			
					85							
					90							

GENERAL NOTES	
Start <u>12/12/78</u>	Complete <u>12/13/79</u>
Crew Chief <u>RS/RJR</u>	Reg <u>CME750</u>
Drilling Method <u>Rotary Mud</u>	

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
 Location N484.687.77 E2,067.591.00

Boring No. S1103
 Surface Elevation 807.53
 Job No. C 8742
 Sheet 1 of 3

1408 EMIL STREET • P.O. BOX 9338, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		↓	Moisture			*	% Gravel	% Sand	% P200	LL
No.	Type		N	Depth						
D0004	SS	X	M	22	Topsoil, Brown to Black Clayey SILT, Trace Fine to Medium Sand (CL,CL-ML)	B	4	90	6	
					Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML)					
					Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)					
D0005	SS	X	M	65	Brown Fine to Coarse GRAVEL and to Some Fine to Coarse Sand, Little Silt and Clay, Occasional Cobbles and Boulders (GP-GM)		52	43	5	
					Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)					
(Continued)										

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
 Baraboo, Wisconsin
 Location N484,687.77 E2,067,591.00

Boring No. S1103
 Surface Elevation 807.63
 Job No. C.8742
 Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9838, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		↓	Moisture		↓		*	% Gravel	% Sand	% P200	LL	PI
No.	Type		N	Depth								
D0006	SS	X	M	35	50	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)	0	94	4			
D0007	SS	X	M	43	70	B						
D0008	SS	X	M	71	85							
					90							

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
Location N484.687.77 E2,067.591.00

Boring No. S1103
Surface Elevation 807.63
Job No. C 8742
Sheet 3 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		↓	Moisture		↓		*	% Gravel	% Sand	% P200	LL	PI
No.	Type		N	Depth								
D0009	SS	X	W	70	95	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)	1	95	4			
					100							
					105							
					110							
					115							
D0010	SS	X	W	33	120	End Boring at 120'						
					125							
					130							
					135							

GENERAL NOTES			
Start	10/31/78	Complete	11/2/78
Crew Chief	HFS	Fig	ACE #1
Drilling Method	Rotary Mud		

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
 Baraboo, Wisconsin
 Location N484.793.05 E2,071,101.83

Boring No. S1106
 Surface Elevation 837.34
 Job No. C 8742
 Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9838, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		↓	Moisture			*	% Gravel	% Sand	% P200	LL	PI
No.	Type		N	Depth							
				5	Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML)						
				10							
				15							
D0011	SS	X	M	13	Tan to Brown Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C					
				20		C					
				25		C					
				30							
				35							
				40							
D0012	SS	X	M	18			14	81	5		
				45	pfl at 45'						

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
 Location N484.793.05 E2,071,101.83

Boring No. S1106
 Surface Elevation 837
 Job No. C 8742
 Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9536, MADISON, WIS. 53715 • TEL. (608) 257-4646

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		↓	Moisture			*	% Gravel	% Sand	% P200	LL
No.	Type		N	Depth						
D0013	SS	X	M	55	Tan to Brown Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)		23	72	5	
				55	pfl at 55'	C				
				60		C				
				65	pfl at 65'	C				
				70	pfl at 70'					
				75	pfl at 75'	C				
				80		C				
				85						
D0014	SS	X	W	49	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt & Clay (SP,SP-SM)	C	9	97	3	

(Continued)

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WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
Location N484.793.05 E2,071,101.83

Boring No. S1106
Surface Elevation 837.94
Job No. C 8742
Sheet 3 of 3

1409 EMIL STREET • P.O. BOX 9838, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture				*	% Gravel	% Sand	% P200	LL	PI
No.	Type	↓	↓	N	Depth							
					95							
					100	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
					105							
					110	pfl at 110'	B					
00015	SS	X	W	60	115			2	96	2		
					120	pfl at 120'	C					
					125							
					130	pfl at 130'						
					135							
						End Boring at 136'						
GENERAL NOTES												
Start 11/14/79 Complete 11/14/79												
Crew Chief HFS, BKH Flg ACE #1												
Drilling Method												
Rotary Mud												

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
Location N484.860.18...E2.072.645.25...

Boring No. S1107Surface Elevation ...Job No. C.8742Sheet 1 of 2

1409 EMIL STREET • P.O. BOX 9536, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		↓	Moisture			*	% Gravel	% Sand	% P200	LL
No.	Type		N	Depth						
					Topsoil, Brown to Black Clayey SILT, Trace Fine to Medium Sand (CL,CL-ML)					
				5						
				10	Tan to Brown Fine to Coarse SAND, Little to Some Silt and Clay, Little to Some Gravel, Occasional Cobbles and Boulders (SM)	C				
				15		C				
				20						
				25	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)					
D0016	SS	X	M	41			0	95	5	
				30						
				35		C				
				40		C				
				45						

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
 Location N484.860.18 E2,072.645.25

Boring No. S1107
 Surface Elevation 810.06
 Job No. C 8742
 Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		Moisture		N	Depth		*	%Gravel	%Sand	%P200	LL	PI
No.	Type	↓	↓									
						Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
					50	Tan to Brown Fine to Coarse SAND, Little to Some Silt & Clay, Little to Some Gravel, Occasional Cobbles and Boulders (SM)						
D0017	SS	X	W	71	55		0	96	4			
					60							
					65	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
					70							
					75							
D0018	SS	X	W	88	80		0	96	4			
					85							
					90							
						End Boring at 78'						
							GENERAL NOTES					
							Start 1/10/80 Complete 1/10/80					
							Crew Chief HFS Rig ACE #2					
							Drilling Method Rotary Mud					

**ENGINEERING INC**

LOG OF TEST BORING

Project Badger Army Ammunition Plant
Baraboo, Wisconsin

Location N484,751.72 E2,073,316.38

Boring No. S1108

Surface Elevation

Job No. C 8742

Sheet 1 of 1

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		Moisture		N	Depth		*	%Gravel	%Sand	%P200	LL	PI
No.	Type	↓	↓									
						Fill Material, Brown Silty CLAY, Some Sand and Gravel						
					5	Topsoil, Brown to Black Clayey SILT, Trace Fine to Medium SAND (CL,CL-ML)						
					10							
					15							
00019	SS	X	W	11	20	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
					25							
					30							
					35							
					40							
00020	SS	X	W	22	42'	End Boring at 42'	0	97	3			
						GENERAL NOTES						
						Start 12/29/80 Complete 1/2/81						
						Crew Chief JR Fig ACE						
						Drilling Method Rotary Mud						

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
 Location N488,536.15 E2,064,509.76

Boring No. S1109
 Surface Elevation 854.68
 Job No. C 8742
 Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		↓	Moisture		↓		*	% Gravel	% Sand	% P 200	LL	PI
No.	Type		N	Depth								
D0021	SS	X	M	NA	5	Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML)		0	18	72		
					10							
					15		C					
					20	Tan to Brown Stratified, Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C					
					25		C					
D0022	SS	X	M	49	30	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)		0	94	6		
					35							
					40							
					45							

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WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
 Location N488,536.15 E2,064,509.76

Boring No. S1109
 Surface Elevation 875.60
 Job No. C 8742
 Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9838, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		↓	Moisture			*	% Gravel	% Sand	% P200	LL	I
No.	Type		N	Depth							
				50	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
				55							
				60	Tan to Brown Stratified, Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C					
				65		C					
				70	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
				75		C					
D0023	SS	X	W	48	Tan to Brown Stratified, Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C	5	92	3		
				80		C					
				85		C					
				90		C					

(Continued)

(Continued)



Project Badger Army Ammunition Plant
Baraboo, Wisconsin
Location N488,536.15 E2,064,509.76

Boring No. 51109
Surface Elevation 854.62
Job No. C 8742
Sheet 3 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53719 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES						
Recovery			Moisture				*	% Gravel	% Sand	% P ₂₀₀	LL	PI	
No.	Type	↓	↓	N	Depth								
D0024	SS	NR	-	100	95	Tan to Brown Stratified, Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM, SW-SM) (SP)	C						
					100	End Boring at 108'	B						
					105		C						
					110		C						
					115		C						
					120		C						
					125		C						
					130		C						
					135		C						

GENERAL NOTES

Start 2/14/80 Complete 2/14/80

Crew Chief HFS, MLC Rig ACE

Drilling Method Rotary Mud

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
 Baraboo, Wisconsin
 Location N486,476.12 E2,073,302.11

Boring No. S1110
 Surface Elevation 87.8
 Job No. C 8742
 Sheet 1 of 2

1408 EMIL STREET • P.O. BOX 9836, MADISON, WIS. 53715 • TEL. (608) 257-4846

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		↓	Moisture			*	% Gravel	% Sand	% P200	LL
No.	Type		N	Depth						
D0025	SS	X	M	30	Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML)	B	12	82	6	
						C				
						C				
						C				
						C				
					Tan to Brown Clayey Silty SAND, Little to Some Gravel, Cobbles and Boulders (SC)	C				
						C				
						C				
						B				
					Tan to Brown Fine to Coarse SAND, Little to Some Silt and Clay, Little to Some Gravel, Occasional Cobbles and Boulders (SM)	C				
					Tan to Brown Stratified, Fine to Coarse SAND, And to Some Fine to Coarse Gravel Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)					
	</									

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WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
Location N485,475.12 E2,073.302.11

Boring No. S1110
Surface Elevation 810.48
Job No. C 8742
Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4846

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture				*	% Gravel	% Sand	% P200	LL	PI
No.	Type	↓	↓	N	Depth							
D0026	SS	X	W	30	50	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)	10	85	5			
					55							
					60	End Boring at 66'	9	93	7			
					65							
D0027	SS	X	M	27	65							
					70							
					75							
					80							
					85							
					90							

GENERAL NOTES	
Start <u>1/15/80</u>	Complete <u>1/15/80</u>
Crew Chief <u>HFS</u>	Fig <u>ACE #1</u>
Drilling Method <u>Rotary Mud</u>	

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
 Location N487,413.09 E2,075,847.11

Boring No. S1111
 Surface Elevation 8
 Job No. C 8742
 Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		↓	Moisture			*	% Gravel	% Sand	% P200	LL	F
No.	Type		N	Depth							
					</						

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
Location N487,413.09 E2,075,847.11

Boring No. S1111
Surface Elevation 846.49
Job No. C 8742
Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		↓	Moisture		↓		*	% Gravel	% Sand	% P200	LL	PI
No.	Type		N	Depth								
					50	Tan to Brown Clayey Silty SAND, Little to Some Gravel (SC)						
					55							
					60	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
					65							
D0030	SS	X	M	50			1	92	7			
					70							
					75							
					80							
					85							
					90							

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
..... Baraboo, Wisconsin
Location N487,413.09 E2,075,847.11

Boring No. S1111
Surface Elevation 49
Job No. C 8742
Sheet 3 of 3

1409 EMIL STREET • P.O. BOX 8838, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		↓	Moisture			*	% Gravel	% Sand	% P200	LL
No.	Type		N	Depth						
D0031	SS	X	W	114	95	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)	0	96	4	
					100					
					105					
					110					
					115					
					120					
					125					
					130					
					135					
					140					
					145					
					150					
					End Boring at 102'					

GENERAL NOTES	
Start	1/2/80
Completed	
Crew Chief	HFS
Drilling Method	Rotary Mud

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
Location N490,049.07 E2,076,746.15

Boring No. S1112
Surface Elevation 836.23
Job No. C 8742
Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9536, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		↓	Moisture			*	% Gravel	% Sand	% P200	LL	PI
No.	Type		N	Depth							
				5	Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML)						
				10							
				15							
				20	Tan to Brown Stratified Fine to Coarse SAND And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)						
				25							
				30							
				35							
				40							
				45							
D0032	SS	NR	-	100							

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
 Baraboo, Wisconsin
 Location N490,049.07 E2,076,746.15

Boring No. S1112
 Surface Elevation 8
 Job No. C 8742
 Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9836, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		Moisture				*	% Gravel	% Sand	% P200	LL
No.	Type	↓	↓	N						
D0033	SS	X	M	74	Tan to Brown Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM, SW-SM) (SP)		17	70	13	

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
Location N490,049.07 E2,076,746.15

Boring No. 51112
Surface Elevation 836.23
Job No. C 8742
Sheet 3 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery				Moisture			*	% Gravel	% Sand	% P200	LL	PI
No.	Type	↓	↓	N	Depth							
D0034	SS	X	W	50	95	* Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP.SP-SM)	0	97	3			
						End Boring at 96'						
					100							
					105	* Tan to Brown Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)						
					110							
					115							
					120							
					125							
					130							
					135							

GENERAL NOTES
Start 1/3/80 Complete 1/4/80
Crew Chief HFS Pig ACE #2
Drilling Method Rotary Mud

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
 Location N491,603.29 E2,079,574.42

Boring No. S1114
 Surface Elevation 8
 Job No. C 8742
 Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		Moisture				*	% Gravel	% Sand	% P200	LL	PI
No.	Type	↓	N	Depth							
					Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML)						
				5	Sandstone Cuttings 4-6½'	B					
				10		C					
				15		C					
				20		B					
				20		B					
				20		C					
D0035	SS	X	M	13			19	73	8		
				25	Tan to Brown, Stratified Fine to Coarse SAND, and to Some Fine to Coarse Gravel, Trace to Little Silt and Clay Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)						
				30							
				35	pfl at 35'						
				40							
				45	pfl at 43'						

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantBaraboo, WisconsinLocation N491.603.29 E2.079.574.42Boring No. S1114Surface Elevation 819.75Job No. C 8742Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		↓	Moisture			*	%Gravel	%Sand	%P200	LL	PI
No.	Type		N	Depth							
				50	Tan to Brown, Stratified Fine to Coarse SAND, and to Some Fine to Coarse Gravel, Trace to Little Silt and Clay Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C					
				55							
				60							
				65	pfl. at 67'	C					
				70							
				75							
D0036	SS	X	M	50			47	49	4		
				80	pfl at 83'	C					
				85							
				90							
					Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
Location N491,603.29 E2,079,574.42

Boring No. S1114
Surface Elevation 75
Job No. C 8742
Sheet 3 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		Moisture				*	% Gravel	% Sand	% P200	LL	PI
No.	Type	↓	↓	N							
						pfl at 92'					
						95					
						Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)					
						100					
						pfl at 103' to 105'					
D0037	SS	X	W	44		105	0	97	3		
						End Boring at 106'					
						110					
						115					
						120					
						125					
						130					
						135					

GENERAL NOTES
Start 11/19/79 Complete 11/20/79
Crew Chief HFS Rig ACE #1
Drilling Method Rotary Mud

WARZYN**ENGINEERING INC****LOG OF TEST BORING**
 Project Badger Army Ammunition Plant
Baraboo, Wisconsin

 Location N490,445.70 E2,070,359.29

 Boring No. S1116
 Surface Elevation 860.41
 Job No. C 8742
 Sheet 1 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		Moisture				*	%Gravel	%Sand	%P200	LL	PI
No.	Type	↓	N	Depth							
				5	Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML)						
				10		C					
				15	Tan to Brown, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SP-SW) (SP)	C					
				20		C					
				25		C					
				30		C					
D0038	SS	X	M	55	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
				35							
				40							
				45							

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project: Badger Army Ammunition Plant
Baraboo, Wisconsin
 Location: N490,445.70 E2,070,359.29

Boring No. S1116Surface Elevation 8Job No. C 8742Sheet 2 of 4

1408 EMIL STREET • P.O. BOX 9838, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		↓	Moisture			*	% Gravel	% Sand	% P200	LL
No.	Type		N	Depth						
					Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and CLAY (SP,SP-SM)					
				50						
				55	Tan to Brown, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C C B C C B C B				
				60						
				65	Continual Fluid Losses between 50' and 85'	C B B C				
				70						
				75						
				80	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)					
				85						
				90						

(Continued)

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
 Baraboo, Wisconsin
 Location N490,445.70 E2,070,359.29

Boring No. S1116
 Surface Elevation 860.41
 Job No. C 8742
 Sheet 3 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		↓	Moisture			*	% Gravel	% Sand	% P200	LL	PI
No.	Type		N	Depth							
D0039	SS	X	W	66	95	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)	5	91	4		
					100						
					105	Tan to Brown, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)					
					110						
D0040	SS	X	W	118	115	tf1 at 115' to 116'	40	54	6		
					120						
					125	Sandstone Cuttings 120' to 125'					
					130	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)					
					135						

(Continued)

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
Location N490,445.70 E2,070,359.29

Boring No. S111
Surface Elevation 860
Job No. C 8742
Sheet 4 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		Moisture				*	% Gravel	% Sand	% P200	LL	PI
No.	Type	↓	↓	N Depth							
D0041	SS	X	W	60+	140	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)					
					145	End Boring at 141'					
					150						
					155						
					160						
					165						
					170						
					175						
					180						

GENERAL NOTE
Start 12/11/79 Complete 12/11/79
Crew Chief HFS Rig ACE #1
Drilling Method
Rotary Mud

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
 Baraboo, Wisconsin
 Location N490,354.23 E2,066,372.44

Boring No. S1117
 Surface Elevation 862.61
 Job No. C 8742
 Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 8538, MADISON, WIS. 53715 • TEL. (608) 237-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		Moisture		Depth	*		% Gravel	% Sand	% P200	LL	PI	
No.	Type	↓	↓									
					5							
					10							
					15							
					20							
					25							
					30							
D0042	SS	X	M	40								
D0045	SS	X	M	60								
					35							
					40							
					45							

(Continued)

WARZYN



ENGINEERING INC

LOG OF TEST BORING

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
 Location N490,354.23 E2,066,372.44

Boring No. S1117
 Surface Elevation 1
 Job No. C 8742
 Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		↓	Moisture			*	% Gravel	% Sand	% P200	LL	PI
No.	Type		N	Depth							
				50	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
				55							
				60	Tan to Brown, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C					
				65		C					
				70		C					
D0043	SS	X	M	54		C	40	54	6		
				75		C					
				80		C					
				85		C					
				90		C					

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
Location N490,354.23 E2,066,372.44

Boring No. S1117
Surface Elevation 862.61
Job No. C 8742
Sheet 3 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES							
Recovery		Moisture				*	% Gravel	% Sand	% P200	LL	PI		
No.	Type	↓	↓	N								Depth	
D0044	SS	X	M	44	95	Tan to Brown, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM, SW-SM) (SP)	C						
					100								
					105	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP, SP-SM)	C						
					110	Tan to Brown, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM, SW-SM) (SP)	C						
					115								
					120	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP, SP-SM)	C	0	98	2			
						End Boring at 121'							
					125								
					130								
					135								

GENERAL NOTES
Start 2/13/80 Complete 2/13/80
Crew Chief HFS, MIC. Pig ACE #1
Drilling Method

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
Location N492.933.24 E2.072.320.48

Boring No. S1118
Surface Elevation 87
Job No. C 8742
Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9536, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		↓	Moisture			*	%Gravel	%Sand	%P200	LL	PI
No.	Type		N	Depth							
				5	Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML)						
				10							
				15							
				20							
				25	Cobbles and Boulders from 19' to 25'	B					
				30		B					
				35		B					
				40		B					
00046	SS	X	M	19	Tan to Brown Fine to Coarse SAND, Little to Some Silt and Clay, Little to Some Gravel, Occasional Cobbles and Boulders (SM)	B	11	73	16		
				20		B					
				25		C					
				30		C					
				35							
				40							
				45							

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project: Badger Army Ammunition Plant
Baraboo, Wisconsin
 Location: N492,933.24 E2,072,320.48

Boring No. S1118
 Surface Elevation 872.84
 Job No. C 8742
 Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		Moisture		N	Depth		*	% Gravel	% Sand	% P200	LL	PI
No.	Type	↓	↓									
					50	Tan to Brown Fine to Coarse SAND, Little to Some Silt and Clay, Little to Some Gravel, Occasional Cobbles and Boulders(SM)						
					55	pfl at 54'						
					60		C					
							C					
							C					
							B					
					65	Quartzite Cuttings	C					
							B					
							B					
							B					
							B					
							B					
					70	Continual Total Fluid Loss Between 67' - 75'	B					
							C					
							C					
							B					
					75							
							C					
					80	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
					85							
					90		C					

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
Location N492,933.24 E2,072,320.48

Boring No. S1118Surface Elevation 4Job No. C 8742Sheet 3 of 3

1408 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		↓	↓	Moisture			*	% Gravel	% Sand	% P200	LL	PI
No.	Type			N	Depth							
D0047	SS	X	W	35		Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)		3	95	2		
					95							
					100							
					105							
D0048	SS	X	W	51		End Boring at 110'						
					110							
					115							
					120							
					125							
					130							
					135							

GENERAL NOTES	
Start	1/27/79
Completed	7
Crew Chief	HFS
Fig	ACE
Drilling Method	
Rotary Mud	

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
 Location N496,201.38 E2,072,983.10

Boring No. S1119
 Surface Elevation 877.67
 Job No. C 8742
 Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9838, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		Moisture				*	% Gravel	% Sand	% P200	LL	PI
No.	Type	↓	↓	N							
					5	C					
					10						
					15						
					20						
					25						
					21						
00049	SS	X	-	21			0	42	58	17.7	2.2
(Divided		Sample		in Two)							
00050	SS	X	-	-	30		0	94	6		
					35	C					
					40						
					45						

Tan to Brown Fine to Coarse SAND, Little to Some Silt and Clay, Little to Some Gravel, Occasional Cobbles and Boulders (SM)

Occasional Layers of Sandy Silt

Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)

Occasional Layers of Clayey Sand

Tan to Brown Fine to Coarse SAND, Little to Some Silt and Clay, Little to Some Gravel, Occasional Cobbles and Boulders (SM)

(Continued)

**ENGINEERING INC**

LOG OF TEST BORING

Project: Badger Army Ammunition Plant
Baraboo, Wisconsin
Location: N496,201.38 E2,072,983.10

Boring No. 5119
Surface Elevation 87
Job No. C 8742
Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9838, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		Moisture		*		% Gravel	% Sand	% P200	LL	I	
No.	Type	N	Depth								
			50	Tan to Brown Fine to Coarse SAND, Little to Some Silt and Clay, Little to Some Gravel, Occasional Cobbles and Boulders (SM)	C						
			55		C						
			60		C						
			65		C						
			70		C						
			75	Large Fluid Losses 73-93'	C						
			80	Brown Fine to Coarse GRAVEL, And to Some Fine to Coarse Sand, Little Silt and Clay, Occasional Cobbles and Boulders (GP-GM)	C						
			85		C						
			90	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)	C						

(Continued)



LOG OF TEST BORING

Baraboo, Wisconsin

Location N496,201.38 E2,072,983.10

Boring No. 877.67
Surface Elevation

Job No. C 8742

Sheet 3 of 3

1409 EMIL STREET • P.O. BOX 9638, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture				*	% Gravel	% Sand	% P ₂₀₀	LL	PI
No.	Type	↓	↓	N	Depth							
D0051	SS	X	W	84	95	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP, SP-SM)	C	13	84	3		
					100		C					
					105		C					
D0052	SS	NR	-	92	110	End Boring at 121'						
					115							
					120							
					125							
					130							
					135							
							GENERAL NOTES					
							Start 1/19/80 Complete 1/22/80					
							Crew Chief... HFS... Rig ACE #1					
							Drilling Method..... Rotary Mud					

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project: Badger Army Ammunition Plant
 Baraboo, Wisconsin
 Location: N493,313.14 E2,075,597.06

Boring No. S1120
 Surface Elevation 877.06
 Job No. C 8742
 Sheet 1 of 5

1409 EMIL STREET • P.O. BOX 9838, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		↓	Moisture			*	% Gravel	% Sand	% P200	LL	P
No.	Type		N	Depth							
					Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML)						
				5							
				10							
				15	Quartzite Cuttings	C					
				20	Tan to Brown Fine to Coarse SAND, Little to Some Silt and Clay, Little to Some Gravel, Occasional Cobbles and Boulders (SM)	C					
				25		C					
				30		C					
D0053	SS	X	M	34		C	1	84	15		
				35		C					
				40		C					
				45		C					

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
 Baraboo, Wisconsin
 Location N403,313.14 E2,075,597.06

Boring No. S1120
 Surface Elevation 877.06
 Job No. C 8742
 Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		↓	Moisture		↓		*	% Gravel	% Sand	% P200	LL	PI
No.	Type		N	Depth								
					50	Tan to Brown Fine to Coarse SAND, Little to Some Silt and Clay, Little to Some Gravel, Occasional Cobbles and Boulders (SM)	C B C C					
					55		C					
					60		C C C					
					65		C					
D0054	SS	X	M	85	70	Tan to Brown Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM, SW-SM) (SP)	C B C C	22	68	10		
					75		C B					
					80		C B C B C C					
					85		C C					
					90							

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
Location N493,313.14 E2,075,597.06

Boring No. S1120
Surface Elevation 87.06
Job No. C 8742
Sheet 3 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture				*	% Gravel	% Sand	% P200	LL	F
No.	Type	↓	↓	N	Depth							
					95	Tan to Brown, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM, SW-SM) (SP)	C C C C C C C C C C					
					100							
					105							
					110							
					115							
					120							
					125							
					130							
					135							
D0055	SS	X	W	40	125	End Boring at 125'						
					130							
					135							

GENERAL NOTES
Start 1/16/80 Complete 1/16/80
Crew Chief HFS
Drilling Method Rotary Mud

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
 Baraboo, Wisconsin
 Location N496,296.77 E2,079,127.02

Boring No. S1121
 Surface Elevation 813.93
 Job No. C 8742
 Sheet 1 of 2

1408 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		Moisture				*	% Gravel	% Sand	% P200	LL	PI
No.	Type	↓	↓	N							
					5	Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML)					
					10						
					15	Tan to Brown Fine to Coarse SAND, Little to Some Silt and Clay, Little to Some Gravel, Occasional Cobbles and Boulders (SM)					
					20						
					25						
D0056	SS	X	M	22	30	Tan to Brown, Stratified Fine to Coarse SAND And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C	14	79	7	
					35		C				
					40		C				
					45	Brown Silty Clay 41'42'	C				

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
 Location N496,296.77 E2,079,127.02

Boring No. S1121
 Surface Elevation 81
 Job No. C.8742
 Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		Moisture				*	% Gravel	% Sand	% P200	LL	PI
No.	Type	↓	↓	N							
D0057	SS	X	W	21	50	C	6	88	6		
					55						
D0058	SS	X	W	43	60		0	91	9		
					61	End Boring at 61'					
					65						
					70						
					75						
					80						
					85						
					90						

GENERAL NOTES	
Start	1/18/80 Complete
Crew Chief	HFS, BLH, RIG AL
Drilling Method	Rotary Mud

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantBaraboo, WisconsinLocation N500,702.29 E2,074,444.43Boring No. 51122Surface Elevation 904.87Job No. C 8742Sheet 1 of 4

1409 EMIL STREET • P.O. BOX 9536, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		↓	Moisture		↓		*	% Gravel	% Sand	% P200	LL	PI
No.	Type		N	Depth								
					5	Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML)						
					10							
					15	Tan to Brown, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C					
					20		C					
					25							
D0059	SS	NR	-	-	30							
					35							
D0060	SS	X	M	19	35		11	79	10			
					40							
					45							

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
Location N500.702.29... E2.074.444.43...

Boring No. S1122
Surface Elevation 9
Job No. C.8742
Sheet 2 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		↓	Moisture			*	% Gravel	% Sand	% P200	LL	F
No.	Type		N	Depth							
				50		C					
				55		C					
				60		C					
				65		C					
				70		C					
				75		C					
				80		C					
				85		C					
				90		C					
D0061	SS	X	M	-			22	71	7		

Tan to Brown, Stratified Fine to Coarse SAND. And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM, SW-SM) (SP)

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
 Location N500,702.29 E,2074,444.43

Boring No. S1122
 Surface Elevation 904.87
 Job No. C 8742
 Sheet 3 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		↓	Moisture		↓		*	% Gravel	% Sand	% P200	LL	PI
No.	Type		N	Depth								
					95	Tan to Brown, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)						
					100		C					
					105		C					
					110							
					115							
					120	Quartzite Cuttings at 120'	C B					
					125							
					130	Brown Clayey SILT, Little to Some Fine Grained Sand, Trace Gravel (ML)						
D0062	SS	X	M	32	135			0	3	97		

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
 Baraboo, Wisconsin
 Location N500,702.29 E2,074,444.43

Boring No. S1122
 Surface Elevation
 Job No. C 8742
 Sheet 4 of 4

1409 EMIL STREET • P.O. BOX 8538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		Moisture				*	% Gravel	% Sand	% P200	LL
No.	Type	↓	N	Depth						
					Brown Clayey SILT, Little to Some Fine Grained Sand, Trace Gravel (ML)					
				140	Tan to Brown, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM, SW-SM) (SP)	C				
				145	End Boring at 144'	B				
				150		C				
				155		C				
				160		C				
				165						
				170						
				175						
				180						

GENERAL NOTES	
Start 1/24/80	Complete 1/80
Crew Chief HFS, BKH	Fig. 100
Drilling Method	
Rotary Mud	

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
 Location N494,500.23 E2,062,374.27

Boring No. S1123
 Surface Elevation 867.03
 Job No. C 8742
 Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		↓	Moisture			*	% Gravel	% Sand	% P200	LL	PI
No.	Type		N	Depth							
D0063	SS	X	M	54	Topsoil, Brown to Black Clayey SILT, Trace Fine to Medium Sand (CL,CL-ML)	C C C C C C C C	10	75	15		
					Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand with Some Cobbles (CL,CL-ML)						
					pfl at 8-11'						
					Tan to Brown, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)						
					Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay with Occasional Thin Seams of Silty Sand (SP,SP-SM)						
						C					
						C					
						C					

(Continued)

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
 Location N494,500.23 E2,062,374.27

Boring No. S1123
 Surface Elevation 86
 Job No. C 8742
 Sheet 2 of 3

1408 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		↓	Moisture			*	% Gravel	% Sand	% P200	LL	PI
No.	Type		N	Depth							
				50	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay with Occasional Thin Seams of Silty Sand (SP,SP-SM)						
				55							
				60							
				65	Tan to Brown, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)						
00064	SS	X	M	31							
				70			44	49	7		
				75	pfl at 72-74'						
				80							
				85							
				90							

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
 Location N494,500.23 E2,062,374.27

Boring No. S1123
 Surface Elevation 867.03
 Job No. C 8742
 Sheet 3 of 3

1408 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		Moisture					*	% Gravel	% Sand	% P200	LL	PI
No.	Type	↓	↓	N	Depth							
					95	* Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt, and Clay (SP,SP-SM)						
D0065	2SS	X	M	60	100			1	94	5		
					105	Tan to Brown, Stratified Fine to Coarse SAND And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C					
					110		B					
					115		B					
					120		B					
					125	* Tan to Brown, Stratified Fine to Coarse SAND And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C					
					130		C					
					135		C					
					140		C					
D0066	2SS	X	W	48	135	End Boring at 135'						

GENERAL NOTES

Start 2/20/80 Complete 2/28/80
 Crew Chief JPR Pig 750
 Drilling Method Rotary Mud

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project: Badger Army Ammunition Plant
Baraboo, Wisconsin
 Location: N497,938.40 E2,072,925.10

Boring No. S1124
 Surface Elevation 873.6
 Job No. C 8742
 Sheet 1 of 3

1408 EMIL STREET • P.O. BOX 9838, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		↓	Moisture			*	% Gravel	% Sand	% P200	LL
No.	Type		N	Depth						
									</	

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant

..... Baraboo, Wisconsin

Location N497,938.40 E2,072,925.10

Boring No. S1124

Surface Elevation 878.01

Job No. C 8742

Sheet 2 of 3

1408 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		Moisture				*	% Gravel	% Sand	% P200	LL	PI
No.	Type	↓	N	Depth							
				50	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
				55							
				60							
				65	Brown Fine to Coarse GRAVEL and to Some Fine to Coarse Sand, Little Silt & Clay, Occasional Cobbles & Boulders (GP-GM)						
D0069	2SS	X	M	51			3	91	6		
				70							
				75	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay with Occasional Thin Seams of Silty Sand (SP,SP-SM)						
				80							
				85							
				90							

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
 Location N497,938.40 E2,072,925.10

Boring No. S1124
 Surface Elevation 8
 Job No. C 8742
 Sheet 3 of 3

1406 EMIL STREET • P.O. BOX 8638, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		Moisture		N	Depth		*	% Gravel	% Sand	% P200	LL	P _i
No.	Type	↓	↓									
D0070	2SS	X	W	100	95-100	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)		7	70	23		
					105-110							
					115-120							
					125-130							
					135-140							
					145-150							
					155-160							
					165-170							
					175-180							
					185-190							
					195-200							
					205-210							
					215-220							
					225-230							
					235-240							
					245-250							
					255-260							
					265-270							
					275-280							
					285-290							
					295-300							
					305-310							
					315-320							
					325-330							
					335-340							
					345-350							
					355-360							
					365-370							
					375-380							
					385-390							
					395-400							
					405-410							
					415-420							
					425-430							
					435-440							
					445-450							
					455-460							
					465-470							
					475-480							
					485-490							
					495-500							
					505-510							
					515-520							
					525-530							
					535-540							
					545-550							
					555-560							
					565-570							
					575-580							
					585-590							
					595-600							
					605-610							
					615-620							
					625-630							
					635-640							
					645-650							
					655-660							
					665-670							
					675-680							
					685-690							
					695-700							
					705-710							
					715-720							
					725-730							
					735-740							
					745-750							
					755-760							
					765-770							
					775-780							
					785-790							
					795-800							
					805-810							
					815-820							
					825-830							
					835-840							
					845-850							
					855-860							
					865-870							
					875-880							
					885-890							
					895-900							
					905-910							
					915-920							
					925-930							
					935-940							
					945-950							
					955-960							
					965-970							
					975-980							
					985-990							
					995-1000							
					1005-1010							
					1015-1020							
					1025-1030							
					1035-1040							
					1045-1050							
					1055-1060							
					1065-1070							
					1075-1080							
					1085-1090							
					1095-1100							
					1105-1110							
					1115-1120							
					1125-1130							
					1135-1140							
					1145-1150							
					1155-1160							
					1165-1170							
					1175-1180							
					1185-1190							
					1195-1200							
					1205-1210							
					1215-1220							
					1225-1230							
					1235-1240							
					1245-1250							
					1255-1260							
					1265-1270							
					1275-1280							
					1285-1290							
					1295-1300							
					1305-1310							
					1315-1320							
					1325-1330							
					1335-1340							
					1345-1350							
					1355-1360							
					1365-1370							
					1375-1380							
					1385-1390							
					1395-1400							
					1405-1410							
					1415-1420							
					1425-1430							
					1435-1440							
					1445-1450							
					1455-1460							
					1465-1470							
					1475-1480							
					1485-1490							
					1495-1500							
					1505-1510							
					1515-1520							
					1525-1530							

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
 Baraboo, Wisconsin
 Location N496,507.67 E2,067,952.90

Boring No. S1125
 Surface Elevation 894.87
 Job No. C 8742
 Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9838, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		↓	Moisture			*	%Gravel	% Sand	% P200	LL	PI
No.	Type		N	Depth							
					Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML)						
				5		C					
				10		C					
				15		C					
				20	Tan to Brown Fine to Coarse SAND, Little to Some Silt and Clay, Little to Some Gravel, Occasional Cobbles and Boulders (SM)	C					
				25							
				30							
00072	SS	X	M	56							
00073	SS	X	M	57			4	94	2		
				35							
				40	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)	C					
				45							

(Continued)

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
Location N496,507.67 E2,067,952.90

Boring No. S1125
Surface Elevation 894.8
Job No. C 8742
Sheet 2 of 3

1408 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		Moisture		N	Depth		*	% Gravel	% Sand	% P200	LL
No.	Type	↓	↓								
					50						
					55	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)					
					60						
					65						
					70						
					75						
					80						
D0074	SS	X	M	64							
					85						
					90	Tan to Brown Fine to Coarse SAND, Little to Some Silt and Clay, Little to Some Gravel, Occasional Cobbles and Boulders (SM)					

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
 Location N500,012.88 E2,063,332.17

Boring No. S1125
 Surface Elevation 874.70
 Job No. C 8742
 Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9536, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		↓	Moisture		↓		*	% Gravel	% Sand	% P200	LL	PI
No.	Type		N	Depth								
D0076	SS	X	M	1	5	Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML) (Silty Clay Appears to Grade into Underlying Sand)		8	48	44		
D0077	SS	X	D	1				22	70	8		
D0078	SS	X	M	4								
					10	Tan to Brown, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C C					
					15							
					20							
					25	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
					30							
					35							
					40							
					45							

(Continued)

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
 Baraboo, Wisconsin
 Location N500,012.88 E2,063,332.17

Boring No. S1126
 Surface Elevation 871.70
 Job No. C 8742
 Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9836, MADISON, WIS. 53715 • TEL. (608) 257-4846

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		Moisture		N	Depth		*	% Gravel	% Sand	% P200	LL
No.	Type	↓	↓								
D0079	SS	X	M	43	50	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)	6	92	2		
					55						
					60						
					65						
					70						
					75						
					80						
					85						
					90						
						C					
						Stiff Clay Layer 89' to 90'					

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
 Baraboo, Wisconsin
 Location N500,012.88 E2,063,332.17

Boring No. S1126
 Surface Elevation 874.70
 Job No. C 8742
 Sheet 3 of 3

1409 EMIL STREET • P.O. BOX 9536, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		Moisture				*	% Gravel	% Sand	% P200	LL	PI
No.	Type	↓	↓	N							
					95						
					100						
					105						
					110						
					115						
D0080	SS	X	W	35	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM) * Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM) Brown Clayey SILT, Little to Some Fine Sand, Trace Gravel (ML)	3	16	81			
					End Boring at 116.5'						
					120						
					125						
					130						
					135						
					* Brown Clayey SILT, Little to Some Fine Sand, Trace Gravel (ML)						

GENERAL NOTES	
Start	2/11/80 Complete 2/11/80
Crew Chief	HFS,MLC Rlg ACE #1
Drilling Method	Rotary Mud

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
 Location N503,380.50 E2,063,312.68

Boring No. S1127
 Surface Elevation 877.17
 Job No. C 8742
 Sheet 1 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		Moisture				*	% Gravel	% Sand	% P200	LL	PI
No.	Type	↓	↓	N							
					5						
					10						
					15						
					20						
					25						
00081	SS	X	M	47	30		0	98	2		
					35						
					40						
					45						

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
Location N503,380.50 E2,063,312.68

Boring No. S1127
Surface Elevation 878.31
Job No. C 8742
Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		↓	Moisture			*	% Gravel	% Sand	% P200	LL	PI
No.	Type		N	Depth							
D0082	SS	X	M	54	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)		19	77	4		
				50							
				55							
				60							
				65							
D0083	SS	X	W	24	Thin Layer of Reddish Brown Clay at 74'		0	96	4		
				70							
				75							
				80	End Boring at 75'						
				85							
				90							

GENERAL NOTES
Start 2/7/80 Complete 2/8/80
Crew Chief WFS, MLC, Rig ACE # 1
Drilling Method Rotary Mud

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
 Location N504,039.10 E2,062,711.52

Boring No. S1128Surface Elevation 9Job No. C 8742Sheet 1 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		↓	Moisture			*	% Gravel	% Sand	% P200	LL	PI
No.	Type		N	Depth							
				5	Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML)						
				10		C					
				15	Tan to Brown, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C					
				20		C					
				25		C					
D0085	SS	X	M	25	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)						
				30							
				35							
				40							
				45							

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
 Location N504, 039.10 E2,062,711.52

Boring No. S1128
 Surface Elevation 877.19
 Job No. C 8742
 Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		↓	Moisture			*	% Gravel	% Sand	% P200	LL	PI
No.	Type		N	Depth							
D0086	SS	X	W	62	Fine to Medium SAND, Trace to Little Fine to Coarse Gravel, Trace to Little Silt and Clay (SP,SP-SM)		0	97	3		
				62							
D0087	SS	NR	-	65	Tan to Brown Fine to Coarse SAND, Little to Some Silt and Clay, Little to Some Gravel, Occasional Cobbles and Boulders (SM)	C					
				70		C					
				75	SANDSTONE, Well Sorted, Fine Grained, Calcitic Cement Weathers to a White Silt	C					
				75	End Boring at 75'						
				80							
				85							
				90							

GENERAL NOTES	
Start	12/18/79 Complete 12/19/79
Crew Chief	HFS... Rig ACE #1
Drilling Method	Rotary Mud

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
 Location N503,571.75 E2,068,121.29

Boring No. S1129
 Surface Elevation 874.2
 Job No. C 8742
 Sheet 1 of 3

1409 EMIL STREET • P.O. BOX 9536, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture				*	% Gravel	% Sand	% P200	LL	
No.	Type	↓	↓	N	Depth							
D0088	SS	X	D	NA	5	Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML)		6	12	82	42.8	24
					10		C					
					15		B					
					20	Brown Fine to Coarse GRAVEL and to Some Fine to Coarse Sand, Little Silt and Clay Occasional Cobbles and Boulders (GP-GM)	C					
					25		B					
D0089	SS	X	H	57	30		C	53	38	9		
					35		C					
					40	Tan to Brown, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C					
					45		C					

(Continued)

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
 Baraboo, Wisconsin
 Location N503,571.75 E2,068,121.29

Boring No. S1129
 Surface Elevation 910.95
 Job No. C.8742
 Sheet 2 of 3

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		Moisture				*	% Gravel	% Sand	% P200	LL	PI
No.	Type	↓	↓	N							
					50	Tan to Brown, Stratified Fine to Coarse SAND; and to Some Fine to Coarse Gravel, Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM, SW-SM) (SP)	C				
					55		C				
					60		C				
					65		C				
					70	Red Clay 69'-71'	C				
					75	Occasional Thin Clay Layers 75'-80'	C				
					80	Tan to Brown Fine to Coarse SAND, Little to Some Silt and Clay, Little to Some Gravel, Occasional Cobbles and Boulders (SM)	C				
					85		C				
					90		C				

D0090 SS NR - -

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
Location N503,571.75 E2,068,121.29

Boring No. S1129
Surface Elevation 910.25
Job No. C 8742
Sheet 3 of 3

1408 EMIL STREET • P.O. BOX 9636, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE				CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		Moisture			*	% Gravel	% Sand	% P200	LL
No.	Type	N	Depth						
			95	Tan to Brown Fine to Coarse SAND, Little to Some Silt and Clay, Little to Some Gravel, Occasional Cobbles and Boulders (SM)	C				
			100		C				
			105	SANDSTONE, Well Sorted, Fine Grained, Calcitic Cement Weathers to a White Silt	C				
			110		C				
			115		C				
			120	End Boring at 120'					
			125						
			130						
			135						

GENERAL NOTES
Start 2/6/80 Complete 2/8/80
Crew Chief HFS, BKH Plo 1
Drilling Method Rotary Mud



Project: Badger Army Ammunition Plant
Baraboo, Wisconsin
Location: N504,612.08 E2,071,642.61

Boring No. S1131
Surface Elevation 940.90
Job No. C 8742
Sheet 1 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		Moisture				*	% Gravel	% Sand	% P ₂₀₀	LL	PI
No.	Type	↓	↓	N Depth							
				5	Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML)						
				10	Brown Fine to Coarse GRAVEL and to Some Fine to Coarse Sand, Little Silt and Clay, Occasional Cobbles and Boulders (GP-GM)	C					
				15		C					
				20		B					
				25	Large(1'-5' diameter) Granitic Boulders 20-35'	B					
				30		B					
				35		B					
				40		B					
				45		B					

(Continued)



LOG OF TEST BORING

Project Badger Army Ammunition Plant
 Baraboo, Wisconsin
 Location N504,612.08 E2,071,642.61

Boring No. S1131
 Surface Elevation 940.90
 Job No. C 8742
 Sheet 2 of

1408 EMIL STREET • P.O. BOX 9838, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery				Moisture			*	% Gravel	% Sand	% P200	LL	r
No.	Type	↓	↓	N	Depth							
D0092	SS	X	M	60+				51	41	8		
					50		B					
						Brown Fine to Coarse GRAVEL and to Some Fine to Coarse Sand, Little Silt and Clay, Occasional Cobbles and Boulders (GP-GM)	B					
					55		B					
					60	Quartzite Cuttings	B B					
					65		B B					
					70		B B					
					75		C					
					80	QUARTZITE CONGLOMERATE, Yellow Brown Sandstone and Red Clay Matrix, Quartzite Cobbles and Boulders up to 15' in diameter (Sandstone Matrix Weathers to a White Silt)	B C					

(Continued)

**ENGINEERING INC**

LOG OF TEST BORING

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
 Location N504,612.08 E2,071,642.61

Boring No. 51131
Surface Elevation 940.90
Job No. C 8742
Sheet 3 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES						
Recovery			Moisture				*	%Gravel	% Sand	% P ₂₀₀	LL	PI	
No.	Type	↓	N	Depth									
						C							
						C							
						C							
						B							
				95		C							
						C							
						C							
						C							
				100									
						C							
						C							
				105		C							
						B							
				110		C							
						C							
						B							
						B							
						B							
				115		B							
						B							
						B							
				120		B							
						B							
						B							
				125		B							
						B							
						B							
						B							
						B							
				Large Fluid Losses 124'128'									
						C							
						C							
				130		C							
						B							
						C							
						C							
				135		C							

(Continued)

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WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
Baraboo, Wisconsin
Location N502,464.29 E2,072,997.91

Boring No. 51132
Surface Elevation 912.97
Job No. C 8742
Sheet 1 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		Moisture				*	%Gravel	%Sand	%P200	LL	PI
No.	Type	N	Depth								
					Brown to Reddish Brown Clayey SILT, Trace to Little Fine Sand (CL,CL-ML)						
			5								
					Cobbles and Boulders Between 5 and 9'	C					
						C					
			10			C					
						C					
			15			C					
						C					
						C					
			20		Fluid Losses Through Cobble Zone 9' to 29'	C					
						C					
			25			C					
						C					
			30		Brown Fine to Coarse GRAVEL and to Some Fine to Coarse Sand, Little Silt and Clay, Occasional Cobbles and Boulders (GP-GM)	C					
						C					
			35			C					
						C					
			40			C					
						C					
			45			C					

(Continued)

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
 Baraboo, Wisconsin
 Location N502,464 29 E2,072,997.91

Boring No. S1132
 Surface Elevation 9
 Job No. C 8742
 Sheet 2 of 4

1406 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		↓	Moisture		↓		*	% Gravel	% Sand	% P200	LL	PI
No.	Type		N	Depth								
D0094	SS	X	M	123	50	Brown Fine to Coarse GRAVEL and to Some Fine to Coarse Sand, Little Silt and Clay, Occasional Cobbles and Boulders (GP-GM)	B C	55	39	6		
					55		C C					
					60	Tan to Brown, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Uccasional Cobbles and Boulders (SP-SM,SW-SM) (SP)	C C					
					65							
					70		C					
					75		C					
D0097	SS	X	M	64	80		C					
D0098	SS	X	M	109	80		C C C					
					85		C					
					90							

(Continued)

(Continued)



Project Badger Army Ammunition Plant
Baraboo, Wisconsin
 Location N502,464.29 E2,072,997.91

Boring No. 51132
Surface Elevation 912.97
Job No. C 8742
Sheet 3 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery			Moisture				*	% Gravel	% Sand	% P ₂₀₀	LL	PI
No.	Type	↓	↓	N	Depth							
D0095	SS	X	M	100	95-100	Tan to Brown Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM, SW-SM) (SP)	C C C C C C C C C C C	0	89	11		
					105-110		C C C					
					115-120		C C C C C					
					125-130	Clayey Sand 131'-132'						
					135-							

WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
 Baraboo, Wisconsin
 Location N502,464.29 E2,972,997.91

Boring No. S1132
 Surface Elevation
 Job No. C 8742
 Sheet 4 of 4

1409 EMIL STREET • P.O. BOX 8538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		Moisture				*	% Gravel	% Sand	% P200	LL	P
No.	Type	↓	↓	N							
					Clayey Sand 136'-137'						
					pfl at 138'						
					140						
					Clayey Sand 142'-145'						
					145						
					Tan to Brown, Stratified Fine to Coarse SAND, And to Some Fine to Coarse Gravel, Trace to Little Silt and Clay, Occasional Cobbles and Boulders (SP-SM, SW-SM) (SP)	C					
						C					
						C					
D0096	SS	X	W	127	150	C	24	75	1		
					Igneous Cuttings	C					
						C					
					155	C					
						C					
					160	C					
					End Boring at 160'						
					165						
					170						
					175						
					180						

GENERAL NOTES	
Start	2/1/80 Complete 2/1/80
Crew Chief	HFS/BKH Fig AC
Drilling Method	Rotary Mud

APPENDIX B
LOG OF TEST BORING

Project: Badger Army Ammunition
Plant: Baraboo, WI
Location: N 3,021.422 ... E 5,149.283

Boring Number: S-83-1147
Surface Elevation: 812.98
Job Number: 4910
Sheet: 1 of 2

R.F. SARCO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6167

SAMPLE			CLASSIFICATION and Remarks	SOIL PROPERTIES				
↓	Stan. Pen.	Depth		% Gravel	% Sand	% P200	LL	PI
17			Very dark grayish-brown (10 yr 3/2) clayey silt (ML)					
	4	1	Dark brown (10 yr 3/3) silty clay (CL)	0	24	76	27	14
-16		2	Brown (10 yr 4/3) silty sand (SM)	0	78	22	NP	NP
	6		Brown (10 yr 4/4) silty clay (CL) common, medium, distinct mottles (seasonal perched water condition)					
13		3						
			Brown (10 yr 4/4) silty, clayey, sand (SM-SC)	0	65	35	22	3
-21	7	4						
			Yellowish-brown (10 yr 5/4) silty clay (CL)					
20		5		0	20	80	29	10
	13							
		6						
		7						
		8						
		9						

(Continued)

(Continued)

APPENDIX B
LOG OF TEST BORING

Project: Badger Army Ammunition Plant
Baraboo, Wisconsin
Location: N. 3.021.422... E. 5.149.283

Boring Number: S-83-1147
Surface Elevation: 812.98
Job Number: 4910
Sheet: 2 of 2

R.F. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 250-0107

SAMPLE		CLASSIFICATION and Remarks	SOIL PROPERTIES				
↓	Stan. Pen. Depth		% Gravel	% Sand	% P200	LL	Pl
14	10	Light, yellowish-brown, gravelly sand (SW) (10 yr 6/4)	18	79	3	NP	NP
0.4	20	Very pale brown (10 yr 7/4) sand (SW)	2	97	1	NP	NP
	30						
	40						
	50						
	60						
	70						
	80	Wet sample					
		Light yellowish-brown (10 yr 6/4) silty sand (SW-SM)	0	90	10	NP	NP
	90	End of Boring					

FILE

APPENDIX B
LOG OF TEST BORING

Project: Badger Army Ammunition Plant -
Baraboo, WI.....
Location: N 2,801.577...E 6,204.146

Boring Number: S-83-1148....
Surface Elevation: 799.49....
Job Number: 4910.....
Sheet: 1.....of 2.....

R.F. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6167

SAMPLE			CLASSIFICATION and Remarks	SOIL PROPERTIES				
↓	Stan. Pen.	Depth		% Gravel	% Sand	% P200	LL	PI
31			V. dark grayish-brown (10 yr 3/2) clayey fine to medium sand (SC)	12	40	48	28	10
24	7	1	Brown (10 yr 4/4) to yellowish- brown (10 yr 5/4) clayey silt	0	33	67	27	5
		2	30% fine and very fine sand (ML)					
	8	3	Common, medium, distinct mottles (seasonal perched water condition)					
17	14	4	Yellowish, brown (10 yr 5/4) fine sandy silt (ML)	0	46	54	NP	NP
9			Pale brown (10 yr 6/3) gravelly, silty, sand (SW-SM)	9	85	6	NP	NP
	18	5						
		6						
		7						
		8						
		9						

(Continued)

(Continued)

APPENDIX B
LOG OF TEST BORING

Project.. Badger Army Ammunition Plant
 .. Baraboo, Wisconsin
 Location.. N. 2,801.577.... E. 6,204.146

Boring Number.. S-83-1148
 Surface Elevation 799.49
 Job Number.. 4910
 Sheet..... 2..... of..... 2

R.F. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6167

SAMPLE			CLASSIFICATION and Remarks	SOIL PROPERTIES				
↓	Stan. Pen.	Depth		% Gravel	% Sand	% P200	LL	Pl
0.2		10	Pale brown (10 yr 6/3) gravelly sand (SW)	42	54	4	NP	NP
		20						
		30						
		40						
		50						
		60						
		70						
			End of Boring					
		80						

APPENDIX B
LOG OF TEST BORING

Project: Badger Army Ammunition Plant -
Baraboo, WI
Location: N. 3, 252, 536 E. 2, 110.671

Boring Number: S-83-1149
Surface Elevation: 803.63
Job Number: 491Q
Sheet: 1 of 2

R.F. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6107

SAMPLE			CLASSIFICATION and Remarks	SOIL PROPERTIES				
↓	Stan. Pen. Depth			% Gravel	% Sand	% P200	LL	Pl
29	6	1	Very dark grayish-brown (10 yr 3/2) silty clay (CL,ML) 26% fine and very fine sand	0	26	74	35	16
29	5	2	Very dark grayish-brown (10 yr 3/2) clayey silt (ML)					
29		3	26% fine and very fine sand	0	26	74	39	10
28	8	4						
24	12	5	Very dark grayish-brown (10 yr 3/2) silty clay (CL)	0	18	82	33	10
		6	Dark brown (10 yr 3/3) sandy clay (CL-ML)	0	44	56	20	7
		7						
		8						
		9						
(Continued)								

APPENDIX B
LOG OF TEST BORING

Project..Badger Army Ammunition Plant
Baraboo, Wisconsin.....
Location...N. 3, 252.536 E. 7, 110.671

Boring Number..S-83-1149
Surface Elevation..803.63
Job Number...4910.....
Sheet....2.....of 2

R.F. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6107

SAMPLE			CLASSIFICATION and Remarks	SOIL PROPERTIES				
↓	Stan. Pen.	Depth		% Gravel	% Sand	% P200	LL	Pl
		10						
11		20	Brown (10 yr 4/3) gravelly sand (SW)	8	89	3	NP	NP
		30						
19		40	Brown (10 yr 4/3) gravelly silty sand (SM)	14	72	14	NP	NP
		50						
		60						
		70						
		80	End of Boring					

APPENDIX B
LOG OF TEST BORING

Project: Badger Army Ammunition Plant -
Baraboo, WI.....
Location: N. 14, 918.656 E. 8,243.989

Boring Number: S-83-1150.....
Surface Elevation: 893.06.....
Job Number: 4910.....
Sheet: 1.....3.....

R.F. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 250-0107

SAMPLE			CLASSIFICATION and Remarks	SOIL PROPERTIES				
↓				% Gravel	% Sand	% P200	LL	PI
	Stan. Pen.	Depth						
14			Very dark grayish-brown (10 yr 3/2) silty sand fill					
12	16	1	Dark brown (10 yr 3/3) clayey sand fill					
		2	Dark brown (10 yr 3/3) gravelly sandy silt fill					
	21							
6		3	Brown (10 yr 4/3) gravelly silty sand fill					
20			Very dark grayish-brown clayey (10 yr 3/2) silt fill					
	36	4	Dark brown (10 yr 3/3) gravelly clayey sand fill					
21		5	Very dark grayish-brown (10yr 3/2) clayey silt fill					
	6		Very dark grayish-brown (10 yr 3/2) silty clay fill					
		6						
22								
	12	7						
		8	Brown (10 yr 4/3) gravelly silty sand fill					
	30							
			(Continued)					

APPENDIX B
LOG OF TEST BORING

Badger Army Ammunition Plant
Baraboo, Wisconsin
N 14,918.656 E 8,243.989

Boring Number S-83-1150
Surface Elevation 893.06
Job Number 4910
Sheet 2 of 3

SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6167

SAMPLE			CLASSIFICATION and Remarks	SOIL PROPERTIES				
✓	Stan. Pen.	Depth		% Gravel	% Sand	% P200	LL	PI
42			Very dark grayish-brown (10 yr 3/2) clayey silt (MH) original topsoil	0	5	95	56	13
23	4	10	Brown (10 yr 4/3) silty clay (CL) Many, coarse, prominent mottles (seasonal perched water condition)	0	4	96	37	20
10			Brown (10 yr 4/4) silty, clayey sand (SM-SC)	5	67	28	17	3
		20						
10		30	Brown (10 yr 5/3) silty sand (SW-SM)	1	88	11	NP	NP
		40						
		50						
		60						
		70						
9		80	Brown (10 yr 5/3) gravelly silty sand (SM)	5	83	12	NP	NP

**APPENDIX B
LOG OF TEST BORING**

Project..Badger Army Ammunition Plant
..Baraboo, Wisconsin.....
Location..N.14,918.656..E.8,243.989

Boring Number..S-83-1150.....
Surface Elevation..893.06.....
Job Number..4910.....
Sheet.....3.....of.....3.....

R.F. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-0107

SAMPLE		CLASSIFICATION and Remarks	SOIL PROPERTIES				
↓	Stan. Pen. Depth		% Gravel	% Sand	% F200	LL	Pl
	100	Brown (10yr 5/3) gravelly silty sand (SM)					
	110						
	120						
	130						
	140						
	150	End of Boring					
	160						
	170						

APPENDIX B
LOG OF TEST BORING

Project: Badger Army Ammunition Plant -
Paraboo, WI
Location N. 21.898.327... E. 12.254.520

Boring Number S-83-1151
Surface Elevation 890.75
Job Number 4910
Sheet 1 of 3

R.F. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-0167

SAMPLE			CLASSIFICATION and Remarks	SOIL PROPERTIES				
↓	Stan. Pen.	Depth		% Gravel	% Sand	% P200	LL	Pl
			- Brown (10 yr 4/3) silty sand (SW-SM)	2	93	5	NP	NP
22	7	1						
		2	- Very dark grayish-brown (10yr 3/2) silty clay (CL)	0	14	86	30	9
25	6							
		3						
	8	4						
		5						
	7							
		6						
	9	7						
		8	- Dark-brown (10 yr 3/3) to brown (10 yr 4/3) silty clay (CL)	0	3	97	36	21
(Continued)								

(Continued)

APPENDIX B
LOG OF TEST BORING

Project: Badger Army Ammunition Plant -
Baraboo, Wisconsin
Location: N. 21,898.327... E. 12,254.520

Boring Number: S-83-1151...
Surface Elevation: 890.75...
Job Number: 4910...
Sheet: 2... of 3...

R.F. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6167

SAMPLE			CLASSIFICATION and Remarks	SOIL PROPERTIES				
↓	Stan. Pen.	Depth		% Gravel	% Sand	% P200	LL	Pl
	26	10	Many coarse, prominent mottles (seasonal perched water condition) (5'-10')					
16			Brown (10 yr 4/4) clayey sand (SC)	0	55	45	28	9
			Light yellowish-brown (10 yr 6/4) (SW-SM) gravelly, silty sand	35	55	10	NP	NP
		20						
9			Very pale brown (10 yr 7/4) sand (SW)	1	95	4	NP	NP
		30						
5		40	Light yellowish-brown (10 yr 6/4) gravelly silty sand (SM)	18	69	13	NP	NP
		50						
		60						
		70						
		80						
		90						

(Continued)

(Continued)

APPENDIX B
LOG OF TEST BORING

Project: Badger Army Ammunition Plant
Baraboo, Wisconsin

Boring Number: S-83-1151
Surface Elevation: 890.75
Job Number: 4910
Sheet: 3 of 3

R.F. SARKO AND ASSOCIATES, INC., Consulting Engineers, 104 King St., Madison, WI (608) 256-6167

SAMPLE		CLASSIFICATION and Remarks	SOIL PROPERTIES				
✓	Stan. Pen. Depth		% Gravel	% Sand	% P200	LL	PI
	100	Light yellowish-brown (10 yr 6/4) gravelly silty sand (SM)					
	110						
	120						
	130						
	140						
	150	End of Boring					
	160						
	170						



ENGINEERING INC

LOG OF TEST BORING

Project Badger Army Ammunition Plant.....

Location Baraboo, Wisconsin

Boring No. S-85-1152A

Surface Elevation

Job No. C 12228

Sheet 1 of 1

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				q _u	W	LL	PL	D
No.	Type	✓	✓	N	Depth						
					0	See Log of Boring S-85-1152B for Soil Descriptions 10' Protective Casing Earth Drill to 55' with Rock Bit					
					10						
					20						
					30						
					40						
					50						
					60						
					70						
					80						
					90						
					100	End Boring at 55'					

WATER LEVEL OBSERVATIONS

While Drilling _____

Upon Completion of Drilling_____

Time After Drilling _____

Depth to Water _____

Depth to Cave In _____

GENERAL NOTES

Start 9/26/85 Complete 9/26/85

Crew Chief LS Rig 9110

Drilling Method



LOG OF TEST BORING

Project Badger Army Ammunition Plant
 Location Baraboo, Wisconsin

Boring No. S-85-11528
 Surface Elevation
 Job No. C 12228
 Sheet 1 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		Moisture		N	Depth		q _u	W	LL	PL	D	
No.	Type	↓	↓									
						0-10" Dark CLAY SILT (Moved 1' & Pushed Shelby Tube from 2-4') Lean, Brown Silty CLAY with Some Sand Seams						
1	SS	18"	M	5	5							
						Advanced to 10' with Auger Pushed 6" Protective Casing Medium to Coarse SAND, Little Gravel, Trace Silt & Clay (SP)						
2	SS	12"	M	32	10							
3	SS	8"	M	18	15							
4	SS	9"	M	47	20							
5	SS	8"	M	48	25							
6	SS	8"	M	51	30							
7	SS	15"	M	55	35							
8	SS	12"	M	100	40							
9	SS	14"	M	42	45	(Stratified with Gravel Seams to Depth of 45')						

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WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, Wisconsin

S-25-11525

Boring No. _____

Surface Elevation _____

Job No. C 12228Sheet 2 of 2

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4846

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		Moisture		Depth	Qu		W	LL	PL	D	
No.	Type	↓	↓								N
						Medium to Coarse SAND, Little Gravel, Trace Silt & Clay (SP)					
10	SS	12"	W	51	50	Dense, Brown Fine to Medium SAND with Trace Silt and Clay (SP)					
11	SS	14"	W	58	55						
12	SS	10"	W	100	60						
13	SS	10"	W	63	65						
14	SS	10"	W	42	70						
15	SS	10"	W	100	75	End Boring at 75'					
					80						
					85						
WATER LEVEL OBSERVATIONS						GENERAL NOTES					
While Drilling _____						9/24/85 9/23/85					
Upon Completion of Drilling _____						Start Complete					
Time After Drilling _____						Crew Chief LS Rig 9110					
Depth to Water _____						Drilling Method _____					
Depth to Cave in _____											

WARZYN**ENGINEERING INC****LOG OF TEST BORING**Project Badger Army Ammunition PlantLocation Baraboo, WisconsinBoring No. S-85-1153

Surface Elevation

Job No. C 12228Sheet 1 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery		Moisture		N	Depth		q _v	W	LL	PL	D
No.	Type	↓	↓								
1	SS	10"	M	9	5	0-10" Dark Brown Sandy SILT Stiff Brown Lean CLAY, Trace Sand (Pushed 3" Shelby Tube, 3-4.5' and Bent by Cobbles					
2	SS	17"	M								
					10	Silty SAND at 4.5' with Little Gravel and Cobbles Drilled to 10' with Auger and Placed 6" Protective Casing					
3	SS	10"	M	54							
4	SS	8"	M	37	15	White Fine to Medium SAND, Trace Gravel, Trace Silt and Clay (SP)					
5	SS	9"	M	42	20	Medium to Coarse SAND, Some Gravel, Little Silt and Clay (SW-SM)					
6	SS	6"	M	38	25						
7	SS	12"	M	45	30						
8	SS	12"	M	66	35						
9	SS	14"	M	94	40	(9/17/85 Drilling mud 13.6' from Ground Surface) Dense, Light Brown Fine to Medium SAND, Little Gravel, Little Silt and Clay (SP-SM)					
10	SS	18"	M	144	45						

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WARZYN



ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location: Baraboo, Wisconsin

Job No. S-85-1153

Surface Elevation

Job No. C 12228

Sheet 2 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES					
Recovery		Moisture		N		Depth	q _v	W	LL	PL	D
No.	Type	✓	✓								
11	SS	12"	M	100	50	Dense, Light Brown Fine to Medium SAND, Little Gravel, Little Silt and Clay (SP-SM)					
12	SS	12"	M	100	55	Dense, Light Brown Fine to Medium Silty SAND (SM)					
13	SS	8"	M	100	60	Some Gravel					
14	SS	12"	M	100	65	Brown Fine to Medium SAND, Little Gravel, Little Silt and Clay (SP-SM)					
15	SS	8"	M	100	70						
16	SS	5"	M	100	75						
17	SS	4"	M	100	80	Well-Graded SAND, Some Gravel, Little Silt & Clay (SW-SM)					
18	SS	3"	M	100	85						
19	SS	4"	M	100	90						

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Dense, Light Brown Fine to Medium SAND, Little Gravel, Little Silt and Clay (SP-SM)

Dense, Light Brown Fine to Medium Silty SAND (SM)

Some Gravel

Brown Fine to Medium SAND, Little Gravel, Little Silt and Clay (SP-SM)

Well-Graded SAND, Some Gravel, Little Silt & Clay (SW-SM)

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WARZYN**ENGINEERING INC****LOG OF TEST BORING**

Project Badger Army Ammunition Plant
 Location Baraboo, Wisconsin

Boring No. S-85-1153Surface Elevation Job No. C 12228Sheet 3 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				q _u	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
						*					
20	SS	6"	M	100 9"	95	Fine to Medium SAND, Little Gravel, Little Silt & Clay (SP-SM) (9/18/85 Drilling Mud 26.6' from Ground Surface)					
21	SS	5"	M	100 7"	100						
22	SS	6"	M	100 8"	105						
23	SS	4"	M	100 8"	110						
24	SS	6"	M	100 4"	115	Dense, Brown Fine to Medium SAND, Little Silt and Clay					
25	SS	4"	M	100 8"	120						
26	SS	5"	M	100 8"	125						
27	SS	5"	W	100 10"	130	Very Dense, Brown, Well-Graded SAND & GRAVEL, Little Silt and Clay (SW-SM) Appears Saturated (9/19/85 Drilling Mud at 26.4' from ground surface)					
28	SS	6"	W	100 8"	135						

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ENGINEERING INC

LOG OF TEST BORING

Project: Badger Army Ammunition Plant

Location Baraboo, Wisconsin

Boring No S-85-1153

Surface Elevation

JOB NO.C..12228

Sheet 4 of 4

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture				q _v	W	LL	PL	D
No.	Type	↓	↓	N	Depth						
						Very Dense, Brown, Well-Graded SAND & GRAVEL, Little Silt and Clay (SW-SM) (Changed Bits from 5 7/8" to 9 1/4")					
29	SS	1"	W	100	140						
30	SS	0"		100		Very Hard Drilling Cuttings Indicate Mostly QUARTZITE					
					145	End Boring at 143.0' (Reamed Hole to 143.0' with 5 7/8" Bit)					
					150						
					155						
					160						
					165						
					170						
					175						

WATER LEVEL OBSERVATIONS

White Drilling

Upon Completion of Drilling _____

Time After Drilling _____

Depth to Water

Depth to Cave In _____

GENERAL NOTES

Start 9/16/85 Complete 9/19/85

Crew Chief LS Rig 9110

Drilling Method

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